SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

No. 1891.—Vol. XLI. LONDON, SATURDAY, NOVEMBER 18, 1871. PRICE ..... FIVEPENCE. PER ANNUM, BY POST, £1 4s.

THE CAUSE AND PREVENTION OF COLLIERY EXPLOSIONS.

Fig. 4.

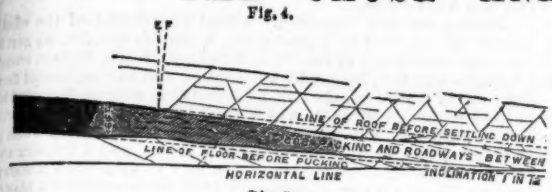
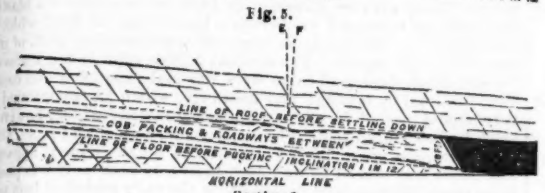
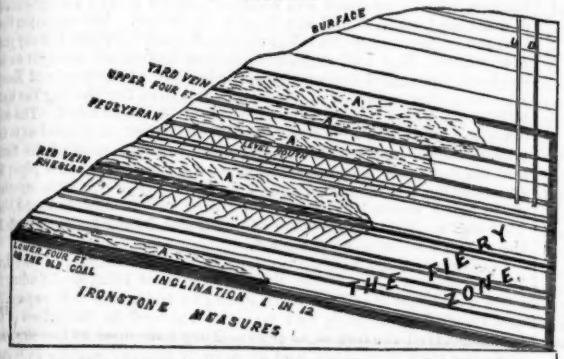


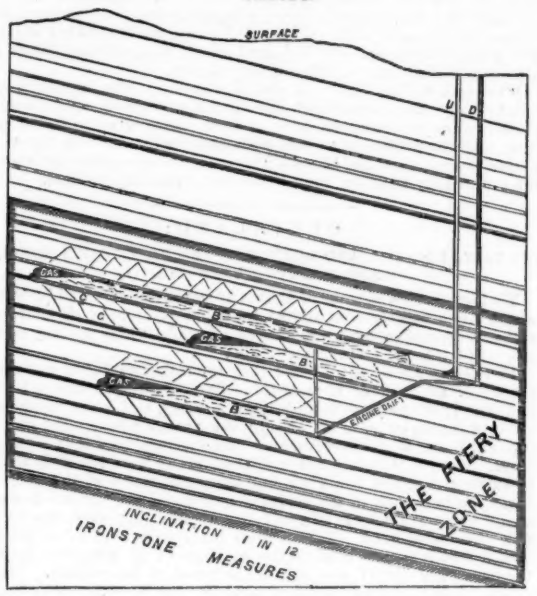
Fig. 5.



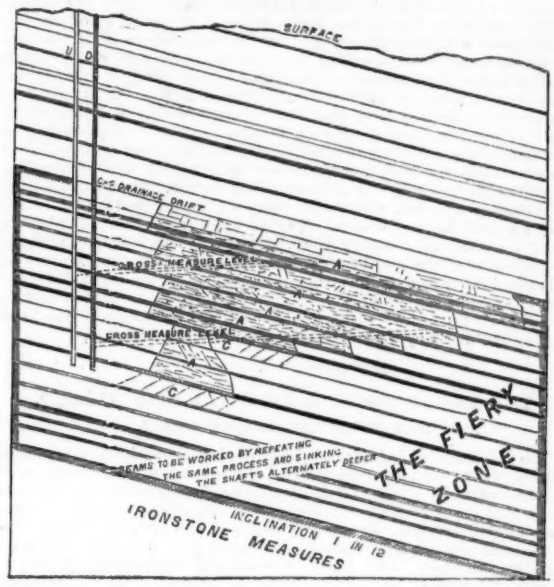
Section 1.



Section 2.



Section 3.



In all the above sections—A represents loosened strata drained of fire-damp; B, loosened strata partly drained of gas, but liable to be filled with fire-damp upon any disturbance of ventilation or by blowers; C, strata cracked by disturbance of the superincumbent weight; D, the downcast shaft; and U, the upcast haft. In Figs. 4 and 5, E is the line of pressure after the squeeze, and F the original line of pressure.

COLLIERY EXPLOSIONS, AND THEIR PREVENTION.

The recurrence of explosions in some mines, and almost total absence of them in others in the same district, and wherein the same seams of coal are worked, has led many to conclude that colliery explosions are for the most part preventible, and that the calamities result not so much from the nature of the coal wrought as from the want of skill in working it. Additional justification is obtained for this view almost daily, yet comparatively little has been done to make known the principles upon which safety depends. In a paper, however, upon the Colliery Explosions of the South Wales Coal Fields, especially in relation to the Merthyr, Aberdare, and Rhondda Valleys, read before the South Wales Institute of Engineers, by Mr. Thomas Joseph, the whole subject is very ably discussed, and as the paper has been reprinted as a separate treatise, there will be no excuse for anyone connected with the management of collieries neglecting to study it. Mr. Joseph's experience has been obtained exclusively in the district of which he writes, and which, moreover, is acknowledged to be one of the most fiery in the kingdom; and some judgment may be formed of the correctness of the principles he advocates, from the fact that himself and his pupils have between them conducted the winning and development of about 5000 acres of the fiery seams of the Merthyr, Aberdare, and Rhondda Valleys during the last 35 years, and without having lost in all more than six lives through explosions of gas in the whole period, and three of those lives were lost together through disobedience of orders.

Some very curious historical facts are given with regard to colliery explosions in South Wales, which are well worthy of consideration. Coal mining has been diligently prosecuted for about 100 years on the northern outcrop of this coal field in Glamorganshire, and on a considerable scale since the beginning of this century; and although the seams were charged with fire-damp to the very outcrop (but subjected to partial drainage at the shallow and exposed crops) no explosion involving the loss of a great number of lives, as far as he is informed or remembers, occurred previous to the year 1845. The South Wales mining engineers of the last generation were proud of their immunity from such accidents in comparing their operations with those of their brethren in the North of England, where the collieries had been subjected from time to time to terrible explosions, attended with great loss of life, dating back as far as the year 1701. There was an explosion, he believes, in the Dinas Pit, Rhondda Valley, in January, 1844, with the loss of 11 lives; but, with this exception, it was a rare thing indeed to hear of an explosion with the loss of one, or two, or three lives. But from the year 1845 the district has been afflicted with a number of great disasters, the first four occurring in the three collieries immediately adjoining each other on the east side of the Aberdare Valley. At Upper Duffryn, 29 lives were lost, in 1845; at Lletty Shenkin, 52 lives were lost, in 1849; at Middle Duffryn, 13 lives were lost, in 1850; and at the same colliery, 65 lives were lost, in 1852.

At Cwmbach Colliery, a shallow winning immediately to the rise of Upper Duffryn, although not notorious for explosions attended with great loss of life, was watched by the late Mr. Mackworth, the first Inspector of Mines appointed for the district, with great apprehension, and ranked by him in the list of the most fiery mines. And yet the colliery of the Aberdare Iron Company, upon the same seam, under Craig-y-Gilfach, to the rise of and adjoining these dangerous mines, being in open communication through old workings with the outcrop, was a safe colliery, and worked with impunity by naked lights. But whilst the district was comparatively free from explosions previous to 1845, we have seen that in the seven years following there were four very heavy explosions; and it appears that the explosions in the coal mines of Great Britain from the year 1851 to 1869, inclusive, each involving the death of 10 or more persons, amount in number to 58, and in the lives lost to 2606. Of these 18 occurred in the South Wales coal field, with the loss of 815 lives, 13 of them being in the steam coal district, with the loss of 623 lives. It appears, as Mr. Joseph very truly remarks, very strange on the face of it that the coal mining of a district comparatively safe, with only one exception, with regard to great and frequent explosions previous to 1845, has since that date, more especially in the new and isolated steam coal collieries, become so fraught with danger, and subject to such terrible and fatal accidents. The exception to which Mr. Joseph refers was a small *isolated* colliery, worked by the Penydarren Iron Company, upon some 30 acres of the Ffosyfran seam, 8 ft. thick, by a pair of 7-ft. shafts, 50 ft. deep, between the years 1805 and 1815, near Pentrebach, in the Merthyr Valley, where there were explosions almost every Monday morning during the whole time, many of them attended with loss of life.

Mr. Joseph foresees that it will, probably, be argued that the coal mining for the ironworks previous to the last 30 years was on a comparatively small scale, and spread over larger areas, thus causing the outflow of gas to be slow, and in small quantities, but it will be easy to show that such was not the case, and that large quantities of coal were worked continuously for many years, and in many cases from very limited areas. With a view to discover the cause of this remarkable change, Mr. Joseph has carefully investigated the circumstances and conditions of coal mining in the district before and since the date above mentioned, as the same seams of coal were worked in both cases, the conclusion at which he has arrived therefrom being that safety from explosions is only attainable by systematically draining off the gas; that the liability of our coal mining to explosions has arisen from, and is in proportion to, the isolation of the collieries, with rise workings walled in gas, and unworked overlying seams; and that all explosions of gas have occurred in rise or up-hill workings. Mr. Joseph maintains that by strict adherence to certain principles, based upon the rigid observance of physical laws, our coal mining, even to a greater depth than any thus far pursued, may be placed, as regards large explosions of gas, in a state of absolute safety. To arrive at this most desirable state of things it will be indispensable that—

1.—The mineral taking in future, for the site of a colliery, should be so selected, and situated, that the shafts can, and be, sunk at or near the summit level of the coal seams to be developed in the property; and as far as possible let there be no barriers of coal left unworked, except the shaft supports, of about five chains radius. This would have the effect of placing an isolated colliery, as far as the circumstances of the case would permit, under the conditions of the safe coal mining, in communication with the outcrop, hereinbefore described.

2.—That the "taking" be submitted to, and be subject to the approval of, Her Majesty's Inspector of Mines of this district for the time being, subject to appeal in case of disagreement to some mining authority appointed by the Secretary of State. (There could be no safer Court of Appeal, I submit, for our district than the Mining Members of the Council of the South Wales Institute of Engineers.) Or what would be better still, that the fiery portions of our coal field which are still unoccupied should be carefully examined by competent authorities, and laid out in suitable blocks, or allotments, say of 500 to 1000 acres each, depending upon position, and the depth of the coal seams; and having in view, before every other consideration, that of safe mining, and the drainage of gas. Such blocks, or allotments, not to be permitted, under legal restraints, to be entered upon, and the minerals won, except in the right order of succession in regard to safety, which would also tend to economic mining. And in all probability it would be advantageous to adopt a similar course, of necessity varied to some extent to meet different geological conditions, in regard to the whole of the coal fields of the United Kingdom. The exposed planes of the denuded strata on the surface, the lines of faults, with the position and depth of the valleys, are sufficient guides for fixing the proper sites for the winnings and marking out the proper limits of each colliery; and I cannot understand that the private interests of lessor or lessee could suffer in any degree by the over-riding of territorial boundaries, in the furtherance of the proper laying out, opening, and working of the minerals, and the protection of human life. On the contrary, the mutual confidence engendered, the feeling of security that would be obtained, by such well-considered action, with the complete and systematic getting of the whole of the workable minerals, could not be otherwise than a source of satisfaction and benefit to all the interests concerned.

In the above diagrams, which we have drawn from those of Mr. Joseph (although we would recommend all who have the opportunity to obtain the originals, which are properly coloured, and have the seams of coal indicated), Section 1 illustrates generally the original method of coal mining of the Merthyr district, by working downward from the outcrop. The section comprises the strata from the Little White Rock, about 20 yards above the Two-feet Nine-inch or Elled seam, downwards to the bottom stone of the Lower Four-feet seam, which embraces what he designates the Fiery or Gas-charged zone of strata, below which there is no gas found until we reach the Pingarw coal and shale above it. These are not shown in the section, but lie about 100 feet below the "Lower Four-feet" seam of coal. Section 2 illustrates generally the system of coal mining adopted in working the isolated and deep collieries of the Aberdare and Rhondda districts, chiefly by workings to the rise of the shafts, and in some cases by engine planes down to the Nine-feet seam, the workings in which are ventilated by staples from the Four-feet, or by a main upcast shaft sunk to the Nine-feet. Section 3 illustrates the method of coal mining advocated by Mr. Joseph for ensuring safety from explosions of gas, and in carrying out which he recommends—

1.—That every colliery have at the least two separate shafts, for downcast, and upcast respectively, each securely walled, or bricked in mortar, throughout of the sectional area of 150 square feet, or upwards, and that usually they should be from 60 to 100 feet apart. In the case of very large takings it would be desirable to have three or four shafts; but two downcasts and one upcast would be quite safe under ordinary conditions of stratification to develope and work 1000 acres of coal, with the other provisions herein recommended being observed.

2.—That it be an absolute condition that every upper seam of coal be worked first; and in advance of each underlying one, if it be within a perpendicular depth of 60 feet, and if the first upper seam be unmarketable in quality, that drainage airways be driven, and made in it to a distance of at least 200 yards from the shafts.

3.—That the colliery be worked down hill—that is, the main roads driven down hill—with the usual intake, and two return airways of large sectional area in each set, so subdivided as to give separate fresh air in splits of (say) 10,000 cubic feet per minute to every separate body of 50 or 60 men employed, which would also secure a temperature not exceeding about 65° Fahr.; if worked long wall of 10 to 15 chains in successive horizontal breadths, with a loose end always on the rise side of the block so worked; bearing in mind, of course, in every case the cleavage of the coal for economic working, and adapting the means accordingly so as to loosen or crack all the overlying and intervening strata, in such a manner as to liberate and facilitate the drainage of the fire-damp as much as possible, if not completely. Any coal being to the rise of the pits should be left unworked at first, until a large breadth (say, 300 yards wide) of the dip coal shall have been cleared out, adjoining the shaft supports, and the overlying strata settled down, then let the rise coal be worked in narrow horizontal breadths, and slowly. Opening out and working collieries in maiden districts largely, or to much extent, by rise-workings can only inevitably lead to great and disastrous explosions from time to time. Nothing can afford a better proof of this than that large blowers of gas, either from the roof of the coal or the floor of the mine, occur almost without exception in rise workings; they are almost unknown, and never troublesome, in dip workings, when the coal is all worked away. This occurrence of blowers always in rise workings is easily accounted for, when we remember that sudden squeezes, or creeps, invariably travel up the plane of the strata, and never down the plane, so that in uphill workings the irruptions of gas would be sudden, and in large volumes; while, on the other hand, in dip workings by the easy settling down of the strata, it would be gradual and easily drained off. The explosion in the Pentre Colliery, in February of this year, caused by a large blower of gas from the roof in the comparatively narrow rise end of the workings, and in disturbed strata, firing at the furnace, and causing the death of all the men in the pit at the time (36 and two afterwards), affords very sad confirmation of the truth of what I contend for in this clause. Had that blower burst down six hours earlier it would have involved the loss of 200 lives. For illustration of this see Figures 4 and 5, the latter illustrating the action and effect of squeeze in dip workings, and the comparatively quiet discharge of the gas from the coal and the intervening strata. In all new collieries in maiden districts, which are isolated of necessity, the danger from gas (say) for the first five or seven years is frightfully increased by a system of rise workings, owing to the sudden and uncertain tapping of large blowers; and after that first period by the wastes being ordinarily such a storage of gas, and that at any disturbance of the ventilation they are liable to be further filled with gas, and add immensely to the difficulties of the ventilation and the dangers of the mine. It, therefore, behoves those who may be opening or who may again open collieries in the maiden districts of our steam coal field to consider these questions well, and not to create for themselves and the men they employ insurmountable difficulties and dangers so easily avoided.

4.—That no pillars, or supports of coal, be ultimately left unworked if in any way possible, except massive shaft supports; with short pillars, and spaces between in shallow workings, as safeguards against surface water, and for the support of buildings on the surface; but below a depth of 500 to 600 feet there can be scarcely any danger from either of these causes; and no barriers of coal should be left between neighbouring properties. I would say here that there is no greater fallacy as regards the influx of water in these lower seams, with their numerous beds of porous sandstone, and laminated shales, than the leaving a barrier of coal. I know of barriers of coal in the Upper Four-feet seam upwards of 50 yards in width, which do not prevent the influx of water at all; and in one case of a barrier of coal in the Nine-feet seam of upwards of a mile wide on the dip line, which, with the open-grained sandstone overlying it, passes the water from drowned out old workings at the rise very freely. A dam of clean small coal, 6 to 8 feet wide, stowed tight, flanked on both sides by a well-packed gob of (say) 30 feet thick—all placed before the squeeze comes on—would form, as I believe, a more secure barrier, than a barrier of coal of greater thickness, than those usually left; besides that, from the loosening of the overlying strata by the squeeze, the drainage of the gas would not be impeded. Still, it is very important to drain all crop-workings of water, and all the springs tapped in sinking, to whatever depth they are found, which seldom exceeds 3 0 feet in depth, by pumping; which I hold is much safer than to dam them back by tubbing, for the reason that sooner or later the springs find their way down below the tub rings, as they have done in every case in our district, thus requiring pumping from a greater depth. But in the shallow collieries where water is found it is, I believe, much better to sink the pumping shafts, and make the lodge-room in a seam of coal or shale, lying beneath the deepest one in work, than to leave a barrier of coal with the object of damming back the water. And the operation which I herein recommend can be repeated economically and safely, as the underlying seams are worked in succession downwards to the lowest beds of the coal field. Moreover, it can safely be said of the maiden districts left in our steam coal field that the coal seams are at too great a depth to be troubled with water in any event.

5.—The next essential condition of safety that should be insisted upon is that

no fire-damp be permitted to be walled in in idle or abandoned workings upon any consideration whatever. This having been allowed under prescribed limitations by the "Mines Inspection Acts," has already been a frequent cause of danger and explosions. Nothing was more impressed upon my mind during my mining education than this, and for which I have been thankful all my life—that is, not to wall in gas, or suffer it to be done. I hold that the abandoned or idle workings of a colliery must be either ventilated or filled up with rubbish, which is by far the safest course when their use is at an end. The cost of doing so would be well repaid by the safety obtained thereby. Many serious explosions have been caused by walled in gas under sudden falls of the barometer or falls of roof, and such explosions are, in my judgment, altogether perfectly avoidable.

6.—Greater care should be taken in the construction of air-crossings than has hitherto often been thought necessary, as evidenced by the frequent and great loss of life through after-damp by their being damaged or destroyed by explosions. They should be always over crossings above and across an arch of solid masonry built in mortar of at least 25 to 30 feet in length. And they should never, if in any way possible, be carried over the main intake.

7.—It is scarcely necessary to say a word about the means of active ventilation, as they are very well understood in the present day, and very careful and exact comparative experiments have been made between them in regard to economy and effectiveness. The main result seems to be this, that down to a depth of upcast shaft of about 500 feet mechanical ventilation by means of Guibal's fan, as strengthened by English engineers, gives a more certain ventilation than the furnace; but for greater depths the furnace, I believe, still maintains the superiority, and offers fewer difficulties at the closed-top of the shaft for drawing coal through the upcast than the machine ventilation. Besides two or three furnaces may be placed in the different seams in a large upcast, and be the means of producing a larger volume of ventilation than could any way be obtained by mechanical means.

In Fig. 4 we give an example of a rise working, and in Fig. 5 an example of a dip working, F representing in both figures the line of weight before disturbance, and E the pressure line with squeeze. It will be seen that the tendency of the squeeze and pucker in a rise working is to produce a crush down on the working face, bringing down gas in strong blowers, and a pucker up towards the face bringing up gas also in blowers. In the dip working, on the contrary, the tendency is to squeeze backward on the gobs and roads, and so liberate the gas slowly and regularly away from the working face; the pucker is likewise backwards, producing a like effect. Throughout the paper Mr. Joseph has given evidence of sound practical acquaintance with the subject, and of the scientific accuracy of his views there can be no question, so that his remark is well justified that he hopes his observations will lead to such thought and discussion upon this solemn and important subject as will end in completing anything he may have left but partially done. His interest in the coal mining of the district is, he adds, sufficient to prevent him recommending anything Utopian or unnecessary, and he trusts that his practical experience has been such as precludes him advocating anything impracticable or difficult of execution. In conclusion, he expresses an opinion, with which many will agree, that it is full time that our coal fields should be regarded more in the light of valuable public or national property than they have been hitherto, without prejudice, nevertheless, in any degree, to the pecuniary claims of private rights; and their proper scientific and practical development should be subject to public enquiry and legal restraints as much, if not more so, as the safety of coal mining in its details has been during the last 20 years, and primarily conducive thereto.

THE MANUFACTURING INDUSTRY OF SCOTLAND.

THE FINNIESTON ENGINE WORKS.

The shipbuilding industry of the Clyde has given rise to many establishments of colossal proportions, both in the centre of Glasgow, in the immediate suburbs, and in other towns and districts more remote from that great highway of commerce. Forges and foundries, marine engine building works, and boiler shops have sprung up like mushrooms within recent years, consequent upon the extension of the iron shipbuilding trade, which now affords employment directly to nearly 30,000 men, and which, taken in relation to its varied ramifications, may safely be pronounced to be the means of employing twice as many more. The Finnieston engine works may be quoted as an example of what we have just premised, and as these works, which are among the first of their kind in Glasgow, and have never previously been described, possess several features worthy of notice, we present our readers with such facts concerning their history, character, and operations as are likely to be generally interesting, expressing, at the same time, our acknowledgments to the partners of the firm for the courtesy and readiness with which they furnished the information.

It is now fully three years since the Finnieston engine works, situated in Hyde-park-street, at the west end of Glasgow, and about 200 yards from one of the finest quays on the Clyde, were built by the present proprietors, Messrs. John and James Thomson. Altogether the works cover 8000 square yards. On entering the gate the boiler shed, an erection 150 ft. in length by 60 ft. in width and 34 ft. in height, instantly commands attention. It is open towards the north-west, and has thus abundance of light and ventilation, the latter desideratum being further supplemented by a large ventilator in the roof. Inside we find a travelling-crane, capable of lifting 30 tons weight, which traverses the entire length of the shed. In connection with the shop there is a number of very large and powerful machines. There are several punching machines, arranged for punching two holes at a time; and there is another punching and shearing machine, capable of cutting a plate 1¼ in. thick, and of punching a hole 2½ in. The latter machine has been supplied by Shanks, of Johnstone, and is fitted up with a special engine. Attached to the boiler shop there is also one of the largest steam rivetting machines that has ever been made. It has a cylinder 18 in. diameter, and is capable of rivetting a 5-ft. plate. This machine is also wrought by a special engine, and above it there is a hoist, 36 ft. high, for lifting the shells of boilers while they are in process of being rivetted. Steam-power is used for lifting, heaving, and lowering the shells, so that all hand labour is obviated. There are two plate and two angle iron furnaces of the ordinary reverbatory description adjoining the boiler shed, and covered with a galvanised iron roof. In front of the furnaces there are setting frames for adjusting the plates. There are, of course, a number of smiths' hearths in the boiler shed, but there is this speciality about them, that they are all adapted for flanging plates, and are thus constructed of different sizes and shapes. All the boilers made by Messrs. J. and J. Thomson are round, and fitted with superheaters; some of the largest size weigh from 30 to 35 tons each.

Between the boiler shop and the smithy, into which we were next shown, there is a range of offices occupying the centre of the yard. They are thus very conveniently situated, especially for the draughtsmen, who occupy the upper flat. In the smithy there are two steam-hammers—one of 15 cwts. and the other of 9 cwts.—both built on Rigby's patent, and supplied by Glen and Ross, Glasgow. There are altogether 22 fires in the smithy, all of them, with two exceptions, being made of cast-iron. There are several iron cranes, fitted up so as to command the range of the fires on either side of the smithy, and in one corner we find a machine for making bolts and nuts of every size. The requirements of the firm are sufficient to keep this machine regularly at work. The smithy, we may add, is supplied with abundant light from the roof and side walls; and on the top of the roof, longitudinally arranged, there are two ventilators, one for admitting the cold and the other for drawing up the hot air.

The most noteworthy erection in connection with the Finnieston engine works is, however, the machine and erecting shop, which measures 275 ft. in length by 70 ft. wide, and 30 ft. in height. It is brilliantly lighted from the roof, which is divided into two bays, supported on iron columns and girders. In one bay there are three and in the other there are two travelling cranes, capable of lifting 40, 20, 15, 12, and 10 tons respectively. These cranes traverse the whole building, from end to end. One of the cranes is wrought by a special engine, while the others are propelled by a hemp rope, which is moved by a very handsome little pair of direct-acting engines, with a 10-in. cylinder. It is worthy of remark that this endless rope, although no thicker than a man's finger, runs at the rate of 4000 ft. per minute; and, in consequence of the high speed at which it is wrought, the rope is capable of lifting 20 tons. The whole of the machinery connected with the rope is under the charge of a boy, who works it with the utmost regularity and precision by means of three small handles. In the erecting shop we found five pairs of marine engines in course of being put together. This does not, however, represent the total amount of work that Messrs. J. and J. Thomson have now on hand, for we understand that they have orders for no fewer than eight pairs of engines of 350 nominal horse-power each, besides two pairs of 450-horse power respectively. In the boiler making department, we may add, they are equally busy.

All, or by far the greater part, of the forgings used at the Finnieston Engine Works are made at the Parkhead forge, which is about four miles distant, and from which they are conveyed on lorries, some of the heaviest forgings requiring ten or a dozen horses to draw them. The castings are executed at foundries in the immediate neighbourhood, the Messrs. Thomson having no foundry department of their own. When the forgings have been delivered at the Finnieston Works they are at once taken to the machine or fitting shop, where they are manipulated with the various tools used for engineers' purposes until they are quite fit to be handed over to those whose duty it is to erect the engines. Among the forgings lying in the erecting-shop on the occasion of our visit there were two very large condensers, and a cylinder 90 in. in diameter. At the north end of the erecting-shop there is a store for workmen's tools, so that when a man requires any particular appliance he does not need to leave the shop There are several lines of rails intersecting the erecting-shop, and communicating with the fitting-shop at the south end. We may explain that the fitting or machine shop is in two divisions or flats, the lighter machinery being above, while the heavy machinery is below. The fitting-shops contain some splendid tools, one of the slotting-machines being adapted to slot a forging 11 ft. high by 16 ft. in length.

Above the smaller fitting-shop, which, as we have already indicated, is on the first floor, there is a pattern-shop, measuring 100 ft. long by 50 ft. in width. Here patterns are made for all the boilers and engines contracted for by the firm, and the shop is fitted up with circular and upright saws, and wood machinery of every kind.

Motive-power is supplied to the machinry not fitted up with special engines by means of two crank overhead engines, one of them 30 and the other 20-horse power. Attached to each of these engines there are two-flued Cornish boilers. One of the engines erected in a corner of the larger fitting-shop is adapted to drive all the machinery in that department, both upstairs and down, and the other engine is used for the boiler-makers' shop, and drives, also, a Russel fan of 4 ft. diameter, which supplies blast to the smithy.

We may add that Messrs. J. and J. Thomson, who employ several hundred workmen, make both high and low pressure condensing engines for marine purposes, some of them working up to 60 lbs. pressure. All the boilers are tested with water before leaving the works. At the present time the Messrs. Thomson are exceptionally busy, all the orders they have on hand being for Clyde shipbuilders.

CLEVELAND:

ITS PAST, PRESENT, AND FUTURE, IN RESPECT TO ITS MINERALS AND MANUFACTURES—NO. III.

We have reviewed some of the many improvements and inventions which have largely contributed to the development of Cleveland, and now intend to offer an outline of such others as may be considered of interest or practical value.

Inventions are of two kinds: they are either useful or not useful, are either adopted or abandoned. Each invention has a history, and that is of the most interesting character, and every invention is either a source of gain or loss to the person whose mind called it into existence, whose perseverance and energy placed it in a tangible form. But ere this was accomplished many were the difficulties to be surmounted, and could we but learn one-tenth of the trials our inventors met with in the accomplishment of their grand designs it would be to us a matter of great surprise that they were ever brought to a successful issue. Yet in man there is a kind of stimulating power, which incites him to the attainment of whatever his mind becomes fixed upon; and this is the secret of his success. Our inventors may have had to endure poverty—for inventors are not generally a wealthy class—and may have had to encounter the greatest difficulties conceivable, may have had to struggle against the strongest opposition ever raised by humanity, when the inventor had secured what he believed would be a protection of his rights to a pecuniary reward for his labour. It is only then his difficulty has attained its climax. It is then when he is called upon to be a teacher of new and strange ideas; then he has to prove the value and superiority of his invention to those who are slow to believe that anything can be introduced which will be an improvement upon their present system of old-established principles. Their idea with respect to the plan adopted by them is something to this effect—"As it was in the beginning, is now, and ever shall be." The inventor has to remove this erroneous impression, and has to prove beyond doubt that the adoption of his plan will be a decided advantage, as regards efficiency, time, or economy—for one at least of these is, we presume, what every invention is expected to claim.

Who that is desirous of having valuable information, or is in search of the curious, cannot find it at the Patent Office, in the pages of those volumes which contain a descriptive account of the inventions which have benefited mankind immensely, and have been perfected by the energy and zeal displayed in the character of the person who originally gave birth to the idea?

The invention itself may be noble; its adoption may be the means of popularising it, and now our inventor may see his machine, or whatever else it may be, throughout the length and breadth of our land, standing as a monument erected, not for any illustrious predecessor or contemporary, but a monument raised by man for himself to gratify his own laudable ambition, and for the benefit of his country. Such men are more eminent and illustrious than a Wellington or Napoleon, a Von Moltke, Bismarck, or Prince Charles, whose deeds, after all, are traceable to the skill of the inventor in the perfection of the weapons and munitions of war employed in the destruction of their enemy.

Inventors are truly public benefactors and the leaders of the people, and theirs is a rapid march of progress; indeed, within the last six months in America alone (which, however, is the nursery of inventors) as many as 60,0000 patents have been obtained. Of this number, it is true, a vast majority are impracticable, and many are foolish, yet a large proportion are exceedingly valuable, and are calculated to effect great changes in course of time. And in Great Britain we may remark the same, and whilst many have been simple and perfectly useless, others have conferred the greatest possible benefits upon mankind in the development of our manufactures and industries. Nor can we over-estimate the value of those. To our inventors we are indebted for the trade supremacy we enjoy, and have enjoyed for many years past; and to our inventors especially are we indebted for the immense development of our iron trade. And of all the iron-producing districts throughout the world perhaps Cleveland more than any other district has laid firmly hold of those inventions, and has as thoroughly and practically illustrated their advantages.

The development of blast-furnaces has been noticed in a previous article, and we have been interested in the surprising results obtained by the erection of larger furnaces—results which, so far as economy in the cost of production of pig-iron, and in the yield of the furnace, were without precedent in the history of the iron trade. Having noticed this subject, therefore, at considerable length, it is our intention to glance at one or two other matters of an equal, or perhaps greater, interest.

Whatever may be the geographical position of blast-furnaces, or however modern may be their construction and excellent their management, unless they have good stove power they will never produce satisfactory results, and the firm will materially damage their best interests. Hence it has been the constant study of firms engaged in the iron trade to secure the best known stoves which would give the highest temperature of hot-blast, and many persons, in every part of the United Kingdom, have devoted considerable time to this subject.

Perhaps the earliest record we have of any practical plan for heating air was that of Robert Sterling, clerk, of Kilmarnock, in 1817. It was exceedingly simple, and was identical with what 40 years afterwards appeared in Siemens' well-known application of the principle—that if a long passage of metal, brick, or any desired substance, be constructed, and a fire placed at one end, the waste gases traversing the passage, would in due time cause the end next the fire to approximate to the heat of the fire, whilst the waste heat will be absorbed by the material forming the passage, whence the waste products will issue at the end thereof at nearly the temperature of the passage; that whilst the waste heat of the fire could be turned into another similar passage, air, gases, or fluids could be caused to enter the heated channel at the coldest end, and would issue at the hot end at nearly the end of the passage. This passage could be again heated by air, gases, or fluids, and in its turn be employed to heat similar compositions. Stirling also claimed to put into this passage bricks or other material, for the purpose of better absorbing the heat, and in turn giving it out as required. A second form was that of a pipe with a diaphragm down the centre; the waste heat would be made to traverse the pipe from one end, and the fluid, or air, or gas to be heated would be caused to traverse the pipe in a contrary direction, and in this manner will absorb all the requisite heat, with an economy hitherto unattainable. Stirling's invention, simple in its character, was the foundation for others of a more successful kind, and it is nevertheless yet of value.

Now that the subject of a higher temperature had attracted the attention of one who had thus far succeeded, there were, as is usual, others found who devoted their attention to the perfection of heating stoves. We therefore find, in 1829, Mr. James Neilson, the manager of the gasworks at Glasgow, conceived an idea for withdrawing the moisture from the atmospheric air in summer, previous to its entrance into the blast-furnace through the tuyeres; for it was observed that the make of iron was materially impaired in summer, both in quality and quantity. Neilson was satisfied that the cause lay in the greater proportion of the moisture contained in the air at that particular season. His plan was to pass the air over calcined lime. About the same time, in order to produce blast for a furnace at Muirkirk, situate ¼ mile from the blowing-engine, he proposed to pass the air through a red-hot vessel, and thus, by expanding it, to enable it to be more effective. This was the first application of hot air to a blast-furnace.

Having satisfied himself by actual experiment of the effect of heated air supplied to a gas-burner, a smith's fire, &c., we next find the idea carried out at the Clyde Ironworks, where Neilson erected a wrought-iron box, heated by a fire-grate, and having heated the air by passing it through the box, he found that with an increased temperature of even 50° there was a great improvement in the working of the furnace. Subsequently, Neilson erected a furnace which had 55 square feet of heating surface per tuyere, and a temperature of 280°, using a cast-iron gas retort 6 ft. by 2 ft. 6 in. But Neilson was not contented with his success. In 1830, he constructed a blast furnace with an increased temperature in the blast of 600°, which had 240 square feet of heating surface, and was heated by 28 ft. of grate-bar surface per tuyere. The obvious defects of this apparatus soon showed themselves, and there were unequal expansion and contraction, followed by leakage and breakage, which have continued to a very recent period in all apparatus; to remedy which, however, in 1832, he introduced the semi-circular oven, with round pipes, attaining a temperature of 600°, the model of all subsequent apparatus. This stove was placed behind each tuyere, as near as it was possible. Thus much did Scotland contribute in the early period of iron manufacture, when Cleveland was unknown, when it was an agricultural district, and when it had not began its career. We mention these inventions because of the effect they had upon Cleveland many years afterwards. Nor had Staffordshire been devoid of thought on the subject of increased temperature; for in 1834, at the works of Messrs. Lloyds, Foster, and Co., of Wednesbury, a plan for heating the blast within a cellular tunnel head of wrought-iron was tried. The cold blast was delivered to it from several apertures, so placed as to distribute the air against the side, exposed to the action of the flame, and the hot blast was conveyed down to the tuyeres in a pipe; the construction was inexpensive, and the heat only 300°, a supplementary stove being erected by the tuyere for to yet further heat the blast. This was the first application of the waste heat of the furnace for the purpose of heating the blast.

Staffordshire did not stop here. Messrs. Firmstone, of the Level Works, Dudley, after trying the Clyde plan of 1832, and finding the pipes would not stand the heat, owing to the under side expanding, and fracturing the pipe, and to being exposed to the action of the fire, conceived the following plan:—They had pipes 10 feet high, and one oven with nine pipes, and an area of heating surface 240 square feet, and these were used to drive a furnace having three tuyeres. This stove had the effect of reducing the fracture of joints and pipes more than any previous one. The temperature of blast also was 600°, and it would appear as if the stove had suited admirably for the furnaces of that period.

Wales added her experience to the subject, and her sons gave their abilities to the question of the utilisation of waste gas in blast-furnaces. Every centre of the iron trade was giving the matter its best consideration. At Dowlais in 1836 the continuous pipe oven was tried with unsatisfactory results, the heat being only 300°, and, consequently, inferior to other systems. At Ystalyfera the plan was tried of heating the furnace by gases collected from near the top of the furnace, and conveying them into vertical round pipes, erected in boxes on either side of the fire-grate, where the blast entering at one end had to traverse each pipe in the main before leaving the stove. The joints of this stove remained good, but as a large amount of friction was put on the blast this form of construction was not adopted.

The spiral pipe stove was erected at Ebbw Vale, in South Wales, about this period. It was heated by the waste gases, and consisted of a continuous round pipe, with socket and spigot joints. This stove did tolerably well, but was stated to cause friction, and hence did not advance in favour.

A stove of different construction was introduced at Codnor Park, Derbyshire, in 1836. The cold blast entered through a small pipe inserted within a larger one directly exposed to the heat, and discharged itself at the far end of the smaller pipe into the larger one, passing back along the annular space between the two pipes, and becoming heated by contact with the outside pipe. It was then collected again into a smaller pipe, inserted in the same manner into a larger one below, and the same process repeated, the hot blast finally passing out at the end of the stove. One of these ovens was arranged behind each tuyere; and although the plan was ingenious, the flanged joints and friction combined were not sufficiently favourable to ensure success.

Other forms of stoves were tried—as, for instance, the horizontal pipe stove at Monkland. This stove was defective in this respect. If a pipe leaked every joint had to be broken, in order to replace it, by drawing back the vertical main. We now arrive at the period when the well-known U-pipe stove was introduced. It was first adopted in Staffordshire in 1837. The stove was constructed on two systems; it was either on the side by side system, or end on. The long oven consisted of 25 pipes, having 1200 ft. of heating surface and 126 square feet of fire-grate, and was capable of heating blast for six tuyeres to 600°. Its defects, however, some became apparent. Fractures shortly appeared in the pipes, especially at tapping time, at the hot end more particularly, owing to the unequal expansion between the blast being on and off. Those constant repairs led to the plan of having several stoves, each of which was supplied with its own hot and cold side valves, also a vacuum valve, to guard against the gas returning from the tuyere to the stoves when the blast was taken off.

The fracture of the pipes at tapping was guarded against years afterwards by blow-through valves being fixed at the hot end. At this period the chief defects appear to have been the failure of the socket joints, caused by irregular expansion and contraction; and, in the second place, the frequent fracture of the pipes at the bend on the top side of the pipe. This defect was in a great measure overcome at Messrs. Lloyds, Fosters, and Co.'s works by putting one side main on rollers and allowing it to expand laterally. Advantage was taken of this circumstance to gauge the heat of the stove by the position of a lever placed in connection with the main, and by marking its position at the melting point of lead, they were thus enabled to approximate the gauge to the state of the heats.

To this period all pipes had been circular in form, about 4 inches diameter, and ranging from 1¼ in. to 2 in. thick. We now find the oval pipe 5 in. by 10 in. inside by 1¼ in. thick, adopted by Mr. Firmstone. An oven of 16 pipes and 700 square feet of surface being used to heat the blast for four tuyeres to 600° and 700°, the fractures now took place on the under side of the bend, owing to this part of the pipe being more easily burnt than the other, and hence it was less able to stand the expansion and contraction.

The U-pipes were at this time made of various forms, with semi-

circular crowns, pear-shaped, and one with the crown bent downwards in the middle; this, however, soon burnt down, like the pistol pipe of modern times, and was not again introduced.

In 1851 we find the circular oven brought out by Mr. Martin Baldwin, containing 24 vertical double pipes 11 ft. high, each pipe 4 in. diameter, and 1¼ in. thick. The blast traversed six pipes simultaneously, passing up and down four times. The fire was in the centre, and the heat rose among the pipes. Subsequently this oven was improved by a centre core. This stove suited so well that it was enlarged by Mr. Henry Marten, of the Parkfield Furnaces, Wolverhampton, into a large double stove, with horse-shoe mains, containing in each half 20 double pipes of 4 in. diameter and 1 in. thick. The temperature was further intensified by a fire-brick core, in order to reverberate the heat against the pipes. The pipes were 12 ft. high, and the total heating surface in the stove was 1500 square feet, and capable of heating the blast for six tuyeres. This stove was regarded as very powerful. Yet it had several defects. It was found, for instance, that good heats soon brought down the great overhanging reverberator, and, in any case, the fire being on one side, caused the pipes to reel over to the wall. Flues were then laid in round the mains, and oval lumps fitted in between the pipes, the heat being caused to ascend and descend behind the same. This plan was an improvement on the former. Other stoves were, however, added better suited to be heated by the waste gases.

THE COPPER TRADE.

SIR,—The importations of copper into this country having fallen off nearly 8000 tons of metal annually ought to hold out some encouragement to the producers of the article that at no distant period a better price for that commodity will be obtained; still the landowners of this country must, or ought to, be prepared to meet foreign competition. Now the world is thrown open to enterprise, labour and capital is sure to flow where wealth is discovered. From the fact that a falling-off of so large a quantity of metal imported last year from that of the previous year clearly shows that some very extensive foreign mines, as well as numerous mines in the United Kingdom, must have come to grief. When the war broke out between France and Prussia immense quantities of copper were sent to this country from France, and that great consuming country stood nearly at a dead lock as regards consumption; but France in the future, no doubt, will again become a large consuming country of copper, as well as that of other metals. Owing to iron shipbuilding going ahead of that of timber, the coppering of vessels is much less than formerly, and the consumption of copper in our navy is very different to what it was half-a-century ago; however, it is apparent that a vast number of the oldest and deepest mines in all countries could not be wrought to pay at the existing price of copper, and during the last few years one after another came to grief, and was shut up. This circumstance must ere long tell upon the future supply of copper.

Since writing the above tin has advanced in price considerably, and Chilian copper about 4*l.* per ton, with an upward tendency.

A. BENNETT.

SPAIN—PAST, PRESENT, AND FUTURE—No. I.

SIR,—A new and brighter era is dawning upon Spain. The gross ignorance of the masses is slowly, but surely, giving way; industrial pursuits are more generally entered upon, and a desire to develope the great commercial, agricultural, and mineral resources of the country is springing up—in short, the cheering beams of improvement are beginning to illuminate the plains and valleys of that formerly enlightened, but, almost since the days of Charles V., dark and benighted land. A new king, a new dynasty, new laws, and a more liberal Government usher in the dawn of a brighter day. This magnificent land, teeming with every treasure, has been from the earliest ages the battle-field of nations anxious to possess themselves of its surpassing riches. Centuries before the Christian era we find Rome and Carthage contending for the mastership of this important peninsula. Attracted by its stores of wheat, oil, wine, silver, and lead, these mighty republics struggled many years for the supremacy, which at last remained with Rome, and enabled the empire to draw for centuries hordes of wealth from her Celtiberian storehouse. In return, Spain received benefits not inferior. In process of time, from intercourse with her masters, she learned to rival them in the arts of peace and war. Some of the most illustrious names of Rome are those of Spaniards—need I mention the two Senecas, Lucan, Trajan, &c. In the middle ages we find the Vandals and other barbarians spreading themselves over the peninsula, to be expelled by the Visigoths, who again in turn were partially driven out by the Moors. Love of conquest and military glory may have partly instigated these invasions; but who can doubt that plunder and the possession of the fertile fields of Spain, her noble vineyards, and especially her rich mines, were the principal causes why successive armies met on her soil, and enriched it with their blood?

During the Moorish occupation great impetus was given to commerce, agriculture, and the arts and sciences; indeed, many of the finest palaces, cathedrals, and castles in the peninsula still exist to show their superlative taste in architecture. The Cross, however, was destined to conquer the Crescent—the Moslem gave way before the Christian, and the union of Ferdinand and Isabella marked a new era in the history of the country.

The discovery of America gave a fresh impetus to Spain, and she became for a time the foremost power among European Governments—a position she still might have held had not her energies been emasculated and her aspirations after improvement and freedom been crushed by her feeble or tyrannical monarchs, governed by worthless Camarillas and the pitiless Inquisition. The brilliant reign of Charles V. for a time upheld her; but from the setting of his sun and the reign of his bigoted son, Philip, down to Isabella, the exqueen, "all the voyage of the State has been bound in shallows and in miseries."

Within the last few years a remarkable change has taken place in the political views and principles of the leading men in Spain, and generally in the popular mind. The Inquisition has been abolished, the yoke of Rome has been broken, and religious and political freedom proclaimed. A great impetus has been given to education. The Press is becoming a power in the State, advocating the onward movement of the times. The *Imparcial*, the *Epoca*, and the *Correspondencia* newspapers of Madrid may compare with any of the continental journals of the period, being conducted with ability, and displaying a deep interest in the future welfare of the country. Provincial papers are also springing up, all of them contributing towards the enlightenment of the masses. To a long list of former ministers whose measures were narrow, short-sighted, and illiberal, who were not even politically honest, and whose reckless management of the public funds brought the country to the very verge of bankruptcy, there have succeeded men of much higher character, both personal and political. The good of their country is the only object of the present ministers. A wise and prudent economy has taken the place of profusion, and every effort is making to raise Spain in the estimation of other States. The enthusiastic reception lately given throughout the country to King Amadeus shows incontestibly the growing attachment of the Spaniards to a king who adheres to legitimate principles, and who is determined to govern constitutionally, and who acts faithfully and impartially towards all parties in the State. Under her young king, with his unbending adherence to the law, his personal courage, and his firm attachment to the constitution, let us hope that Spain may again rise to her proper position among the nations, having through centuries of suffering and trial discovered that there is no health for any people that do not fear God and honour man.

But why write all this, you may exclaim, to the *Mining Journal?* I answer because, under this settled Government and these greatly improved national prospects, a great field is opened up for the English capitalist, and, in addition, when we consider how railways are being laid down in every direction, how easily under good engineering her rivers may be made navigable, and her crude and clumsy mining machinery replaced by that of modern construction, there is little doubt the abundant wealth of Britain will flow in a direction whence the most lucrative return may be expected. I mean, therefore, with your permission, to say a few words in future papers about the mineral wealth of Spain, and to give an account of my visit to some of its celebrated mining districts.

My advice being requested by certain members of the Portuguese Government upon some engineering matters, I proceeded to Lisbon, and whilst there my attention was called to the wonderful mineral wealth of both countries; and, though not a professional in mining matters, my experience may be of some worth, and of some service to parties who may be contemplating investing in Spanish or Portuguese mines. TRAVELLER.

PATENT GAS MANUFACTURE AT BARNET.

SIR,—I learn that some time back a company was formed for working the patent of Dr. Eveleigh for a new and cheap method of manufacturing coal gas, and that the same has merged into a second and more influential company. In fact, I am told that the 1*l.* shares are already at a premium of 16*l.*, or upwards. I further hear that the City authorities have examined and reported favourably on this patented scheme, and only await the public lighting of the town of Barnet, as undertaken by the company, to decide whether or not to adopt the same process in the metropolis. I hope some of your correspondents will favour us with full particulars, as, from all I can gather, the saving to gas consumers will be something enormous; indeed, I have heard that gas may thus be supplied at 1s. 6d. per 1000 cubic feet, instead of from 4s. 6d. to 6s., by the present methods of manufacture. This is certainly a novel and most important feature, and we can only hope that it is not too good to be true.—*Charing Cross, Nov.* 13. A GAS CONSUMER.

OUR COAL SUPPLY.

SIR,—I am extremely sorry that through the inadvertent introduction of the word "not" in the 24th line of my letter, which you were good enough to insert in the *Mining Journal* of last week, the meaning which I wished to convey was entirely reversed. The passage, with its omission, would correctly represent my intention; and I shall feel much obliged if you will allow me to make the explanation in your next Number.—*Burley Wood, Nov.* 16. W. FIRTH.

BIRMINGHAM, AND THE BLACK COUNTRY.

SIR,—I see, from the Supplement to the *Mining Journal* of last week, that my name is brought very prominently forward; and I also find the writer has made several mistakes respecting my early days. I was trained by an excellent mother, who sent me for seven years to Reddare Hill school, and I also had the benefit of marrying an educated wife, whose assistance to me was of inestimable value. I should be much obliged if you would insert this letter in your next issue.

Netherton Ironworks, Dudley, Nov. 15. N. HINGLEY.

DISCOVERY OF IRONSTONE IN ANGLESEY.

SIR,—At a period so very interesting in reference to the iron trade, allow me to submit that a large formation of ironstone (yielding 37¼ per cent. from a sample taken from near the surface) has been discovered recently in this locality, situated within 1½ mile from a creek on a sand beach on the eastward side of the bay and harbour of Holyhead. The colour of the ore is black, similar to coal, and perfectly free from sulphur. On the north-western side of the formation a red and yellow gossany stuff outcrops in a body, indicating, I presume, that the ore at a moderate depth increases in richness.

The country that bounds it is chiefly killas. The elevation of the land where it is found is about 450 feet above the level of the sea, to which a natural sloping of the land extends along a small rivulet, at which place also the Irish telegraph cable is connected with the wires extended from the Anglesey Central Railway. RICH. JONES.

Llanfairynghornwy, Anglesey, Nov. 15.

PRACTICAL MINING—TRIBUTERS' ORES.

SIR,—I will endeavour to explain as clearly as I can my meaning with regard to the parcel of 6 per cent. produce, and also to remove the impression under which your correspondent, "H.," is evidently labouring. The samples of the said parcel were assayed by the respective assay masters of the buyers and sellers, and the settled produce thereof (as returned by them) was 6. It is equally true that the tributers' produces amount to nearly 6½ per cent., but the difference is covered by the decrease. And I am informed by many tributers that they have worked in Cornish copper mines where the decrease in a mixed parcel has been as high as 3s. in 1*l.* I shall be glad to see the method by which "H." will divide the parcel as it really stands—making the produce of the parcel (6) the basis of calculations. B. S.

MINING IN CARDIGANSHIRE.

SIR,—In the Supplement to the Journal of Feb. 4, Capt. Absalom Francis wrote—

"Bodcoll during the past few months has opened the richest course of ore in the district, and, being on the richest lode yet worked in Cardiganshire—the Frongoch—is likely to become as rich as that mine. Machinery is now being erected which, when completed, will also place the property in a good position, and leave the fortunate proprietor what he richly deserves—many a thousand a year for his pluck and judgment. Great Darren, which has also baffled so many, has had a splendid lot of machinery erected by the same party as the last mentioned, is working to the good, and cannot fail to become a rich mine."

We now understand that his predictions are being verified. Mr. Girdwood has been slowly, but surely, moving in the opening up of his mine—the Gertrude. From the rich course of ore referred to he has sunk a perpendicular shaft 14 fathoms; and to meet the great level of the mine, which is being driven from dressing-floors to the shaft, he has from the bottom, which is south of the lode, driven in a northerly direction about 5 fathoms, where on Saturday he had, as anticipated, cut into the course of ore which he has in the 20, and up to the surface. This discovery gives another 14 fathoms of backs to the course of ore referred to above, and the ore being very rich, solid ribs of great thickness, and of improved value at this depth, we may look for a lively time of it now in this secluded spot. The machinery, which is almost ready for work, is of the newest and most economical description, and all self-acting appliances taken advantage of, the whole being under the superintendence, and constructed by, Mr. George Green, of Aberystwith, Mr. Girdwood's manager of his mining properties. Great Darren is turning out well also, and promises to be as great as ever in Mr. Girdwood's hands. MINER.

WITH WHAT ARE THE STRATA ABOUT PRODUCTIVE COPPER LODES MINERALISED?

SIR,—I have read with much interest the remarks of your different correspondents on this subject; and I do not write to pretend to throw any light on the matter, but should feel much obliged to "Mining Engineer," or any other of your correspondents, giving their ideas as to the origin of mineral lodes, whether they are formed originally with the earth or subsequent. I cannot conceive that lodes are merely deposits of minerals in cracks or fissures, of the earth, but that lodes were formed in the beginning—"As it was in the beginning, is now, and ever will be." Take a copper-producing district, and we find those lodes, or veins, have pretty generally the same bearing. If merely dependent on cracks, or fissures, in the earth, and the mineral deposited from the bounding strata, we might expect to find those cracks, or fissures, in all directions. My opinion is that the strata on one or both sides of a productive copper lode do not at all times contain the componant parts for the deposit or formation of copper ore, but that the medium is water, within the walls of the lode, that furnishes the solution of the different substances for the formation of ores, and that it is also through the agency of water that copper lodes diminish or decay, if I may use the term. I very much doubt the utility of analysing the strata with a view to find a rich deposit of copper ore; I would rather analyse the water to see what proportion of copper it contains. And to find a rich deposit, follow out the old system of mining—that of opening the lode on the back, judge of its character, and endeavour to find the shallow bunch. I have yet to learn but that all copper lodes have their shallow bunches of ore "in the gossan," Devon Consols, South Caradon, East Caradon, Buller, with numerous others, and I have no doubt but that if new districts in Devon and Cornwall were explored similar results would follow.

It has occurred to me that the quantity of copper in solution that flows into our rivers in Devon and Cornwall would be of immense value, if it could be profitably extracted. If "Mining Engineer," or any of your correspondents, would state their views as to the origin of mineral lodes, and give a statistical idea as to the quantity of copper in solution (sulphate of copper) that might be supposed to flow from the mines in Devon and Cornwall, it would interest me, and no doubt many readers of your widely-circulated Journal?

Nov. 8. GEORGE EVENS.

CORNISH TIN MINING.

SIR,—What is to be the price of tin, and what are our tin mines to pay? The present quotations are 151*l.* for fine tin, equal to 90*l.* and 91*l.* for the best black tin per ton! The sale for the months of July and August, at Dolcoath, was over 191 tons, which realised 15,613*l.*, yielding gains of 5294*l.* The subsequent advance in price would have increased that sum to 6055*l.*, and, should the prognostications of the *Times* prove true, these profits will augment at 100*l.* per ton to at least 8000*l.*, or (say) 48,000*l.* annually—*i.e.*, six dividends a year of 5*l.* 10*s.* each on 1432 shares, or 10 per cent. annually on a market value of 330*l.*, justifying an advance of 120*l.* per share on the current value of the day. Tincroft will pay, with tin at 100*l.* per ton, at least 60,000*l.* annually, and Carn Brea promises to equal it. These mines are all worked practically, and remind one forcibly, when comparing them with many another situate in the same county, of the wide difference betwixt the "old and new schools" of mining. Why should not Botallack, Wheal Owles, North Levant, and other St. Just mines pay as well as those in the Carn Brea district? Simply, in my opinion, for these reasons—Energy and practical skill are required in St. Just as well as in Camborne and Illogan, and are these wanting? Would Dolcoath or Tincroft pay the shareholders so well as they do if the ends were driven by a single man, having a borer in one hand and a hammer in the other, instead of one man holding and turning the borer, and another striking it with a two-handed mallet? In other words, would Mr. Fell, the eminent engineer, have constructed his corkscrew railway across the Alps if he displayed no more activity, vital energy, and practical application of labour than is apparent in carrying out the works at North Roskear, North Crofty, Pedn-an-drea, and other mines?

The stupendous tunnel through Mount Cenis is acknowledged to be a wonderful feat of engineering skill and practical application of labour. Why should not the managers of our Cornish mines be men of education, of scientific attainments, and mining experience, with gangers or foremen to overlook the men, as practised by the contractors for paving the metropolis with asphalte, or those who construct the viaducts and tunnels of our railways? If such a system were adopted, no mines in Colorado, Nevada, or Mexico would pay so well as the tin mines of the south-west peninsula of England, with black tin at 100*l.* per ton. Again, mining must be divested of what is known "in well-informed circles" as the vested interest of Cornwall—keeping the mines at work simply to create labour, consume materials and machinery, pay dues or royalties to the lords, and fatten the executive, and wholly regardless of dividends accruing to the shareholders. North Roskear and North Crofty have paid no dividends for a quarter of a century, yet at least a quarter of a million of minerals have been raised and sold, and the proceeds expended in Cornwall, without the slightest advantage to the shareholders. The miner of the "old school" is content when returns meet expenditure. Not so the modern miners, who have changed Dolcoath, Carn Brea, Tincroft, Phœnix, and Par Consols into such wonderful fields of activity and wealth.

The practice of sound mining is similar in character to that recognised in every other branch of speculative enterprise—economy of time and expenditure—*i.e.*, quick and cheap returns of minerals to market, leaving the future to develope itself; in fact, the vested interests of "exclusive" Cornwall must merge and become wholly subordinate to that of the proprietors of the mines, as is the case in every other branch of native industry, whether manufactures, trade, or commerce. Would the Suez Canal ever have been completed if the works had been carried out upon the principle pursued at St. Ives Consols? This property gave 450,315*l.* gains upon an outlay of 7520*l.* Yet for the past ten years no outside shareholder has received a dividend from the large returns monthly brought to market. Black tin is now 90*l.* per ton, and soon will be 100*l.* There are thousands of fathoms of ground in this mine "high and dry" that can be wrought at 10*s.* to 12*s.* 6*d.* in 1*l.* at the present price of that metal. The gains referred to were acquired when tin ranged from 40*l.* to 45*l.*, and not exceeding 50*l.* per ton. Such lumbering, discordant mines as this, and others of the "old school," should be pruned of incumbrances, and vitality infused into the management and conduct of its affairs and working. An engineer of progress and practical skill, acquainted with the operations of contractors in railways, canals, buildings, sinking shafts, and tunnelling, as carried out in every other part of England, except Cornwall and Devon, can appreciate to the fullest extent the morbid agony endured by Byron when reflecting upon fallen Greece, compared with its ancient grandeur, when he exclaimed—

"'Tis Greece, but living Greece no more,
For soul is wanting there!"

R. TREDINNICK,
Consulting Mining Engineer.
3, *Crown-court, Threadneedle-street, London, Nov.* 16.

SCIENTIFIC MINING.

SIR,—I have read and re-read Mr. Williams's letter on what he has termed Scientific Mining, published in the Supplement to the Journal of Sept. 16. Nevertheless, I am unable to see what scientific principle is involved in the compound motto or maxim, or whatever else it may be designated—"the point of junction," "the point of deposit," "no junction," "no deposit." If this assumption were sufficiently true to be laid down as an axiom in mining, it would still be found based on and derived from experience, and in most instances forced suddenly upon the attention by the occurrence of the event itself, without being anticipated by a single preliminary thought in respect thereof by any individual.

The science which relates to this part of mining is a branch of natural philosophy, and consists in and emanates from the knowledge of natural laws, their modes of operation and effects. These operations are inviolable and constant, and this is so well known and so universally admitted, that the most temporary suspension of their operations, or any deviation from their customary courses, has been questioned, and still is, by thousands in the present day—philosophers and others—in opposition even to the authority and testimony of the sacred writings.

Natural science, so far as man is concerned, is like all other sciences progressive, and may at some period in the future be more intimate in its relations to mining—that is to say, more intimately known and more familiarly recognised. We know the fact now of its connection, and its regulating and controlling power in this department of nature, but do not know its mode of working, and in that the science is involved. If I assert that the veins in the district with which I am connected in my mining pursuits are subject to displacement by cross-courses and faults, and that the direction of such displacement is always towards the lesser angle, I assert a fact, but its knowledge was not acquired by any abstract or concrete principles of science, but by observation and experience. I found it to be so by my exploratory operations. Is it proper, therefore, that I should claim to have made a discovery in science and an addition to its knowledge? I simply observed the angle towards which the movement occurred, after ascertaining the fact itself.

So far back as my memory can aid me in recollecting, I distinctly remember the favourable theories predicated from the junction of metalliferous lodes; and in that old mining district of Cornwall the result very frequently confirmed the theory; but still the maxim—"no junction," "no deposit," is very far from being true of that district; and in confirmation of this assertion I take the liberty here of naming the main lode of Dolcoath, and if further evidence were necessary, its great parallel—that of North Roskear—might be referred to, and many others might be named in the same and adjacent districts, besides what might be added thereto from the eastern and intermediate districts of Cornwall, as well as from the most celebrated mines of Devon.

The Comstock lode of this State—Nevada—which for years yielded one-third of the silver raised throughout the known world, and is

still yielding far in excess of every other lode, has never been in junction with any other. The maxim—"the point of junction," "the point of deposit,"—may be correct in a special sense of some districts, but "no junctions," "no deposits," appears to me to be far too wide of the truth to merit a formal refutation; neither do I think that the junction of two ill-favoured lodes would be productive of any improvement in value, unaccompanied by other favourable conditions—a congenial change of ground, and other contributory circumstances, such as a change of character, bearing, dip, &c., of the lode itself, which conditions are material, mutually dependent, and influential.

Mr. Williams appears to be sincere in the delusions under which he labours, as he flatters himself that his supposed discovery, if not obscured to some extent on being submitted to the public, would injuriously affect the reputation and standing of sundry individuals; and being unwilling to become, even unwittingly, the instrument of misfortune to others, he very considerately proposes to designate his phantasy a new science, and publicly states his reasons therefor.

I am quite sure that Mr. Williams, or any other person whose researches in physical science enable them to comprehend and elucidate the laws which govern the mineral kingdom, and regulate the aqueous and gaseous currents therein—upon which the metalliferous products depend—would be hailed as a benefactor of mankind, and be enrolled in the archives of fame with imperishable renown.

Harvey immortalised himself by his discovery that the blood circulated through the animal system; but it will be long before the physiology of inorganic Nature can be studied and comprehended like the animal structure, the world of which is clearly and tangibly represented by isolated individual cases. ROBERT KNAPP.

Ellsworth, Nye County, Nevada, Oct. 18.

MINERS' LIFE AT THE SILVER MINES IN NEVADA, U.S.

SIR,—Silver mining in the New World is now again all the rage, to the neglect of our home mines. A miner's life in Nevada, however, is not an enviable one. As a curious photograph of the state of society in that Territory, the following extract from a letter from Pioche is amusing, and will, I hope, prove instructive to intending visitors:—

"Pioche is the county seat of Lincoln county, a mining camp a year old. It is in the great American desert, and situated between bare mountains, looking over a bare dry plain. Water has to be brought eight miles, by wagon, and is sold at 6 cents. per gallon. There are about 1200 people here, the half of whom have been in State prison (stage and highway robbers, &c.), and the rest ought to be. Our graveyard has 41 graves, of which but two are filled by death from natural causes. The rest all died with their boots on—shot mostly, some cut. One shooting scrape took place in the bank, in which Mike Casey killed Tom Gossin, after receiving Gossin's fire. There is no law. Anyone feeling aggrieved seeks redress generally with his pistol. It's been a close game for me several times. I got cut in the leg once, but I am here yet. I sleep with a big bull-dog, a Henri rifle, and a six-shooter. The mines (silver) employ about 600 men, about 100 are in business, and the rest are blackguards of the worst kind—cattle thieves, renegade Mormons, and men who are banished from society by their crimes, and ready for anything. It's thirty miles to railroad or telegraph. We have three stages a week, and one mail. I've done very well here, and would have made some money, but two of my partners in a claim were killed, and I can't go on alone. My life has been attempted twice by the party who killed my partners. I don't allow any man to scare me if I can have a show, but when it gets down to cases where you dare not sit by a window, or by an open door, after dark its time to jump the game. If ever I get back to California I think I'll stay there; any way, I've got enough of this kind of living. I am tired of packing a six-shooter around night and day."

A very nice state of things, Sir, you will admit. G. C.

Swymbridge, Nov. 15.

THE EBERHARDT AND AURORA MINING COMPANY.

SIR,—As the shareholders of the Eberhardt and Aurora Company will meet on Monday next, to decide on the best mode of increasing the capital of the company, I have thought that a few remarks on the company's present and future prospects may not be uninteresting. Doubtless the shareholders feel some disappointment at being asked to provide additional capital at this time. If, however, they calmly analyse the manager's reports, and take into consideration all the surroundings of the company, there will be found but little cause for discouragement. The directors are men of unimpeachable integrity and business capabilities, and well fitted for the task of bringing this undertaking to a successful issue. The reserves of ore recently discovered are of great value, and it appears to me that the position of the company is as good now as it was at the last meeting, with the exception of the additional expenditure on capital account. The net profit realised in three months since the last meeting amounts to about 30,000*l.*, and during one of these months the mill was running on tailings and very low-grade ore.

According to the manager's report, the International Mill will crush at least 80 tons of ore daily, and he estimates the present reserves of ore of the average value of £30 per ton in the Ward Beecher Mine alone as sufficient to keep the International Mill running for 12 months. In 300 working days this would give a gross return of 240,000*l.*, and the total cost (at $16 per ton) of producing the silver will leave a net profit of 163,000*l.* The North Aurora Mine is said to be equally rich, thus the amount of net profit will be raised to 326,000*l.* The old mines were thoroughly inspected before the above discoveries were made, and the estimated profits on which the company was formed may certainly be put at 200,000*l.*, giving a total estimated net profit of 526,000*l.* Added to this, it appears that an injunction has been obtained against the Ward Beecher Consolidated Mine, and there is every prospect of substantial damages being given.

Another point for consideration is the fact that the lowest depth at which these mines have been worked is only 90 ft. If all mining experience is worthless, then it may be said that there is a prospect of these mines being exhausted within a few years; but all mining experience shows that the deeper mines are worked the richer they become, and this rule holds good in America as it does in England; therefore, further valuable discoveries of ore in this company's mines may be looked upon as certain.

Scientific and practical mining engineers, both in this country and in America, are thoroughly imbued with the belief that in the White Pine district rich and well defined silver-bearing lodes will be discovered beneath the enormous chambers of ore now being worked by this and other companies. In one instance a shaft was sunk, at the Crown Point Mine, to a depth of 1400 feet, which came upon a bed of silver ore of great richness. This discovery increased the value of the mine 1000 per cent. in 24 hours.

The additional capital required by the Eberhardt and Aurora Company is simply to meet an expenditure on exceptional contingencies, which could scarcely have been anticipated, and which cannot occur again. Mechanical difficulties in connection with the engine, boilers, and tramway have occurred, which have all been easily overcome, but which have involved great delay and expense. The result, however, will soon be felt by a great diminution in the working costs. If the shareholders are prudent they will raise the additional capital temporarily only, as the profits they may certainly anticipate will enable them to pay off the amount shortly, as well as to pay handsome dividends.

The directors thoroughly deserve the unanimous support of the shareholders. Let it be borne in mind that since the formation of the company the directors purchased a third mine (the Ward Beecher Mine), for 10,000*l.*, which will certainly bring to the shareholders a return of at least 250,000*l.* A.

Nov. 17.

PINTO MINING COMPANY.

SIR,—The directors of the above company have issued a circular inviting applications for 8000 unallotted shares of 5*l.* each, and they also state at the same time that "the reduction works are nearly completed." Would it not have been advisable to have waited the results of working the mills before they called up 40,000*l.* further capital (out of which the vendors will take 20,000*l.*) as I cannot see anything in the original prospectus of the company to justify the same?

The purchase-money of this mine was 100,000*l.*—*i.e.*, 40,000*l.* in fully paid-up (deferred) shares, and 60,000*l.* in cash. The first issue of shares was 10,000, at 5*l.* each, out of which the vendors received 30,000*l.*, leaving 20,000*l.* for working capital, and the cost of erecting the necessary machinery, mills, &c.

In considering the change of opinion in the public mind as regards the stocks of the Eberhardt and the South Aurora Companies, and also that the strongest recommendation of the Pinto Mine was that it was situated in the same district as those two mines already mentioned, which district has been utterly condemned as being anything but a true mining district by Mr. Hague, I say, would it not, therefore, have been advisable to have deferred issuing any further stock until the mine had been thoroughly worked, so that some of the statements in the original prospectus (as regards anticipated profits) had been satisfactorily proved by well authenticated returns from the mine?

At the time the prospectus was issued, in June last, public attention in this country had just been directed to this section of Nevada, but the experience gained since then will not warrant our expecting profitable results from mining in that district, as it has been proved that "the ore is contained in chambers, and are not true fissure veins, being entirely unlike the general character of American mines. SHAREHOLDER IN AMERICAN MINES.

London, Nov. 16.

CHONTALES CONSOLIDATED MINE.

SIR,—The shareholders in this company will, I am sure, be grateful to you for having drawn attention to the late reports received from Mr. Belt. This is not the first time Mr. Belt has disappointed us, for I well remember in a report dated Oct. 20, 1868, he led us to believe that the profit for the year 1869 would exceed the expenditure by 11,200*l.* Contrast that calculation with the miserable information received last week, three years after the receipt of his expressed opinion. I do not intend to impugn Mr. Belt's motive in issuing such a report, but I do contend that the result has shown he had not the slightest foundation for doing so, and I believe the new company would never have been successfully floated but for these promises, which have not been realised. I have, Sir, every confidence in the board of directors, but none whatever in their servants in Nicaragua.

AN ORIGINAL SHAREHOLDER.

SWEETLAND CREEK GOLD MINES.

SIR,—As an original shareholder in the above company, I have been much astonished to see the shares falling continuously from day to day. I was only congratulating myself a short time since that my investment of 4*l.* per share in these shares had returned me as much in dividends as an investment of 10*l.* in Eberhardt would have done, and wondered why my shares stood at 4*l.* while Eberhardt's were at 35*l.* I have enquired at the office, and learn that everything is going on well, the last clean up being most satisfactory, and that there per share, or 20 per cent. per annum, at the end of this month. The only discouraging feature I could learn was that for six or nine months, while the new tunnel is being completed, our dividends may be smaller, or perhaps *nil*, but that afterwards we shall be in a better position than ever.

Now, what I did, Sir, was this: I bought some more shares at 3*l.* 2*s.* 6*d.*, and mean to buy again if they fall further. If you will kindly insert this it may encourage some of my fellow-shareholders, and induce them to do as I have done.—*Nov.* 8. A COUNTRY SHAREHOLDER.

CALIFORNIAN MINING ENTERPRISE.

SIR,—As one of the owners of the Independence Mine, I must emphatically contradict the assertions and insinuations contained in the letter of Mr. G. F. Parsons, secretary to the self-constituted Mining Bureau of the Pacific Coast, published in the Supplement to last week's Journal. We never had any communication with the Bureau relative to the purchase of the mine or the formation of the company to work it, or on any other subject whatever; and, as we were in possession of the Bureau's report on the mine before the purchase was made, or any steps taken for forming a company—as we never heard of the Bureau in the matter until July last, when its report on the mine was handed to us, or since then until the publication of Mr. Parsons' letter—and as the withdrawal of the company took place in September last, it is obviously false and without foundation to assert that the withdrawal is an illustration of the "healthful influence of the Bureau," inasmuch as any such influence, if it ever existed, would certainly have operated in deterring us from purchasing the mine our object in so purchasing it being to form a company to re-purchase it of us—of course at a reasonable profit—for the purpose of developing it on the extended scale warranted by its unquestioned merits.

It is not true it was sought to re-sell the mine at a profit of 60,000*l.*, or anything approaching that sum, as Mr. Parsons would have it inferred; neither is it true that the company collapsed for want of support, the amount of capital actually subscribed by *bona fide* parties being 21,480*l.* in excess of the capital of the company.

I refuse to believe the Bureau's reports are unprejudiced and without favour, as asserted by Mr. Parsons; the fact being that the Bureau's report on the Independence Mine, in the most essential particular by which its value can be tested, gives the value of the quartz for free gold alone, from six several assays, as averaging the enormous yield of $418·56 per ton; whilst the professional agents, on whose recommendation the mine was bought, value it only at $12½ to $13½ per ton, which, in their estimation, is a most profitable average.

The reference made to the Bureau's report in the prospectus was confined to such statements as were believed to be beyond controversy or dispute, and no reference whatever would have been made to it had not its previous appearance in your columns *in extenso* rendered it impossible for us to ignore its existence in so important a document without incurring the risk of sinister and improper motives being attributed to us.

The Bureau's report was made at the instance of "middlemen" in California, who had bonded the mine, but who failed to make a profit on their bond. Possibly this may be the cause of the foul attack made on us by the Bureau.

Nov. 17. ONE OF THE OWNERS.

WEST JEWELL.

SIR,—By the proceedings at the general meeting of this mine, held at the London Tavern on Nov. 7 (the particulars of which appeared in last week's Journal), shareholders present and those absent who read the reports presented must have their confidence strengthened in the ability of the directors and manager of their property. The reports are very satisfactory, and the exercise of a little more patience, say a few months longer, will fully reward every shareholder in the shape of handsome dividends, and a most valuable property of, perhaps, 100 years duration.—*Nov.* 14. A SHAREHOLDER.

CEFN CONSOLS.

SIR,—A disappointed shareholder was glad to see a notice in the Supplement to last week's Journal of the intention of shareholders in this badly-managed concern not to sit still and quietly watch their property dwindle away without some effort on their part to save it, and if possible bring about a better state of things. I urge that a committee of investigation be appointed to enquire into and protect the shareholders' interest, and endeavour to obtain some return for the capital invested.—*Nov.* 14. SHAREHOLDER.

[For remainder of Original Correspondence see to-day's Journal.]

Meetings of Public Companies.

RUSSIAN (VYKSOUNSKY) IRONWORKS COMPANY.

At the meeting of shareholders, on Monday, the report stated that the directors are not in a position to deal with the question of dividend, but propose, out of the balance standing to "profit and loss account," to create a "reserve and contingency account," to which they will carry the great portion of the former account, and to continue to do so until the latter shall have accumulated to such an amount as will not only be sufficient to strengthen the company and carry out its primary engagements to the Russian Government, but likewise be ample, in the opinion of the directors, to cover any possible claims on the part of the Schepeleffs. They have, therefore, carried a sum of 30,000*l.* out of the profit and loss account to the reserve and contingency fund, and have transferred out of the forfeited share account the sum of 7500*l.*, in reduction of the purchase of the interest in the works at Vyksa, which is now reduced to the nominal amount of 15,000*l.*, leaving a balance on profit and loss account of 1518*l.* to be carried forward to next year's account. In taking this course the directors hope that the recommendation they have made will meet with the approval of the shareholders generally. The business of the company is now progressing satisfactorily; and the directors believe that if the shareholders will only forbear until the position of the company is strengthened, and the disputes with the Schepeleffs are adjusted, there is a career of prosperity before it.

QUEENBOROUGH CHEMICAL COMPANY.

The first general meeting of shareholders was held at the company's offices, Billiter-street, on Wednesday, when a statement of what had been done since the formation of the company was laid before them. It was shown that the directors had taken possession of the freehold premises, plant, machinery, and sailing-barge, and that they had made satisfactory purchases of an extra engine and boiler, and were erecting an additional acid chamber, &c. The works are in active operation, producing copperas, acid, and manures, in which a good business has already been done, realising large profits on the prices obtained for the goods. The increased plant and machinery will materially tend to develope the business of the company, which gives promise of steady augmentation.

The shareholders present expressed their satisfaction at the report, and passed a vote of thanks to the directors for their past services, and the proceedings, which were otherwise formal, terminated with the usual acknowledgments to to the Chairman and secretary.

WEST LLANGYNOG SILVER-LEAD MINE.

The first meeting of subscribers was held at the offices of the company, New Poultry Chambers, London, on Nov. 10,

Mr. C. H. YEWEN, M.D., in the chair.

The CHAIRMAN read letters of a most favourable nature in reference to the mine from Capt. Knotwell, manager of the Old Llangynog Mine (which adjoins this property), and also from Capt. Jas. Thomas, who was for 20 years manager of the same mine. He said he felt great pleasure in meeting his co-adventurers, as he had lately visited the locality, and was highly pleased with the progress made at several of the young adventures now being worked there, and more especially with the prospects presented at the West Llangynog. He had visited many mines, but he never saw one more favourably situated, as it was lying between two mines; and as the plans on the table before them showed, adjoining each of them, east and west, on the east they were joined by that wonderful mine called Old Llangynog, which had returned nearly 5,000,000*l.* worth of lead in about 70 years; and as the lode in that mine improved more and more as they drove west towards their property, they having a course of ore now within about 500 yards of the western boundary nearly 1 yard wide, solid ore; and from the specimens lately broken on the back of the lode and in the adit level, there could be no doubt of the lode of the old mine continuing through their property; and another important fact was that they had cut a fine lode at Cwm Llech, adjoining their mine on the west. Looking at all the features in connection with this property, he had every faith in its proving a lasting-paying mine, and that rich results would shortly be realised.

Capt. S. E. MARTIN, M.E. (formerly agent of the Lisburne Mines), said he had lately visited the property, and it was his decided opinion that this would prove one of the best mines in the neighbourhood. No mine could be better situated, having such a rich neighbour as the Old Llangynog. He had such confidence in the mine turning out a great prize that he had taken a large number of shares in the first division, and he looked forward to the time when he confidently believed they would bring him in a fine yearly income. He had also introduced it to several of his friends, who had become shareholders, and he had no doubt he should receive their best thanks after a short time for having introduced so valuable a property to their notice. He could fully endorse all the statements contained in the letters of Capts. Knotwell and Thomas, just read to them, and he could assure the gentlemen present that both those parties could be fully depended on, being to his knowledge, after many years acquaintance with them, both thoroughly practical miners; and from their many years connection with the Old Llangynog Mine, no two men were more capable of giving a practical opinion of the merits of this property, and he thought the shareholders might consider themselves very fortunate in having secured the services of Capt. Thomas as their manager; for after the 20 years' experience he had as manager of the old mine, and being so thoroughly acquainted with the run of the lodes, it certainly might be said he was the right man in the right place. He also considered the plans before them, prepared by Mr. Dennis (than whom a better mineral surveyor and dialler could not be found in the kingdom), reflected great credit on that gentleman, showing plainly, as they did, that the lodes in the Old Llangynog Mine passed direct into this property. (The samples of lead now on the table were broken from these lodes.) Mr. Dennis having been dialler to the old mine for many years, and making all the working plans of the mine, was an undoubted authority on the subject. In conclusion, he would just say that this mine could be worked at very little cost, as they could get the ore by means of adit levels, and that there was a fine stream of water passing through the sett, sufficient for dressing any quantity of ore all the year round.

The Rev. E. MUCKLESTON said he had been connected with mines in the locality for many years, and at one time was the proprietor of Craig-y-Mwyn, now called East Llangynog. He considered the district to be second to none in Wales for the productiveness of the lodes. Many of these mines were worked by the Romans, who merely worked them to a shallow depth, and left millions is a striking example, having made such immense returns as their Chairman had stated, while it had paid in royalty alone to the Powis family about 400,000*l.* As the lodes in that mine are proving so very rich in the western ground as they drive towards this property, there was every reason to believe they have a very rich prize in West Llangynog, which only requires a short time and a moderate outlay to prove.

It was then unanimously resolved that the mine be divided into 10,000 shares at 2*l.* each (limited), making a capital of 20,000*l.* This would entitle the present subscribers to 8000 shares of 2*l.* each, leaving 2000 shares to be further subscribed for by them and the public for future working capital, should it be required. A committee was then appointed with power to carry out the necessary arrangements for incorporating the company under the Limited Liability Act, and to appoint a solicitor, who will prepare the necessary documents appertaining.

Mr. W. H. HEPBURN proposed a vote of thanks to the Chairman, and said he would take that opportunity of stating that, as a director and shareholder in several companies, he felt highly pleased with the manner in which the proceedings of the company had hitherto been carried out; and from the statements made by the Chairman and the two gentlemen who had just spoken, he believed the company was started under more than usually favourable auspices. As one of the committee, he should have great pleasure in accompanying his colleagues on a visit to the property.

NORTH SNAILBEACH SILVER-LEAD MINE (SALOP).

A special general meeting of the gentlemen interested in this property was held at the Golden Lion, Llandysilio, on Nov. 7, to decide upon the future working of this important property, when the following favourable report from Captain J. T. Davies, late managing agent of the Craig-y-Mwyn Mine (now East Llangynog), was read, and received by those present with great satisfaction:—

North Snailbeach Silver-Lead Mine, near Westbury, Salop.—I beg to hand you the following facts relative to this mine:—There are four large lodes running into your sett, two of which run for the full length of it—the north lode, the north-west lode, the east and west, or new lode, and the south-west lode. The north lode is 12 ft. wide, containing rich lead ore, carbonate of lime, and barytes; this lode is of the same nature as the old Snailbeach vein, which is without doubt one of the richest lodes ever discovered in Shropshire, and has produced more ore than any other mine in that county. At one time they had in the old Snailbeach Mine a solid rib of lead ore 8 ft. wide in the north-west end, and in the south-west end a solid rib of lead 6 ft. wide, besides 14 ft. wide of splendid mixture rich for lead. The North Snailbeach is in the same district as the old Snailbeach, Tankerville, Roman Gravels, and Pennerley Mines, and the stratification the same, while the lodes are identical. The 13 fm. shaft has intersected the north lode, which at that depth is 12 ft. wide; the level is driven on the course of the footwall, and to-day I broke some splendid stones of lead ore near the footwall, which is going down looking well. The hanging wall is improved, but I should expect a course of lead ore against the top wall even as such a shallow depth, as there is lead in several places at surface. About 10 or 12 fms. ahead of the forebreast of this level the south-west lode makes a junction with the north lode; in this place I expect to have a good course of lead. I believe this to be the Big vein from Tankerville or Gravels Mine: it has the same strata as the Batholes and Roman Gravels Mines, and I look forward for great results at this part. There is a good quantity of lead on the mine at present that would pay to wash for market, but we want a crusher and dressing materials. There is a splendid course of rich lead ore dipping into the hill, about 30 fms. down the 63 fm. shaft; this shaft is about 30 fms. south of the 13 fm. shaft, and all whole ground between. The 63 fm. shaft has intersected the deep adit level, and intersected the north lode; in driving north upon the lode they had a good course of lead, getting stronger and wider nearing the hill. In driving south on the lode, to meet the junction of the north-west lode, there is an open crevice full of lead going down under the level, and from this what must be the prospects when we come to the junction? I have discovered an east and west lode at the end of the hill, and to-day it is highly impregnated with spots of lead and lime at 4 ft. in depth, and I expect it will soon lead to a good course of ore at this point, and a fine body of lead in the level at the bottom of the 13 fm. shaft. I find, from the authority of the railway company, that the late company sent away from the mine the last twelve months they worked it, in 1865, no less than 1942 tons 12 cwts. of lead ore and barytes. I shall be able to give you a more definite report, with a plan of the working, shortly.—J. T. DAVIES.

The gentlemen present expressed themselves highly pleased with the report, and several of them having recently paid a visit to the mine, and taken some fine samples of lead ore from it, were able to confirm the accuracy of the above report.

The necessary capital for carrying on the works vigorously was subscribed, and Capt. S. E. Martin, late of the celebrated Lisburne Mines, was appointed purser and inspecting agent.

EAST POOL MINING COMPANY.

At a meeting of adventurers, held at the mine on Monday, the accounts for August and September showed a profit of 1466*l.* 3*s.* 6*d.* A dividend of 1600*l.* (5*s.* per share) was declared, and 13*l.* 3*s.* carried to the credit of next account.

"The committee beg to call the attention of the shareholders to the suspense account, which is in excess of what was computed, and which arises from the two following causes:—The drawing-engine, erected to increase our returns, has cost more to complete than at first estimated; and, as already stated, we have purchased a pumping-engine at Wheal Tehidy, which, with extras connected therewith, has cost about 700*l.* Independently of the above, the alterations of the shaft, skip, and guides, has rendered it impossible, through delay in drawing tinstuff, to make the returns anticipated to the extent of at least 800*l.* more. No further addition will be made to the suspense account; and we expect henceforward to keep up our dividends and gradually pay off the debt."

The following report from the agents was read to the meeting:—

Nov. 13.—Great Lode: The 180 is driven east of the cross-cut from the engine-shaft 15 fathoms, and is worth for tin 20*l.* per fathom. The 180 is driven west 17 fms., and is worth 20*l.* per fathom. A stope in the back of this level is worth 20*l.* per fathom. The both ends and the stope are free from wolfram. In the 170, east or west, there is no alteration since the last account. The winze sinking below the 170, about 20 fms. west of the engine-shaft, is down 6 fms., and is worth for tin 25*l.* per fathom. There are four stopes in the back of this level—two east worth 18*l.* per fathom, and two west worth 12*l.* per fathom each stope. The 160 west has been driven 4 fathoms since last account; it is approaching a winze sinking below the 150, on Pryce's lode, and producing low-quality tinstuff. The winze is down 27 fms., and is of much the same character and appearance as the end. There are three stopes working in the back of the 160, worth 18*l.* per fathom each stope.—Engine Lode: The 150, west of eastern cross-cut, is worth 16*l.* per fathom. The 150, west of Dennis's cross-cut, is worth 12*l.* per fathom. Two stopes in the back of the 170 are worth 18*l.* per fathom each stope.—South Lode: The 150 is driven west of the south cross-cut 12 fathoms, and is worth for tin and copper 12*l.* per fathom. A rise in the back of the 150, on the cross-course, is up 2 fms., and is worth for tin 8*l.* per fathom. The 140, driving south from the engine lode, to intersect the south lode, is in about 11 fms., and is still in ground favourable for driving. The 130 is driven east of the western cross-cut 38 fms., and is worth for tin and copper 15*l.* per fathom. The winze over the end sinking below the 100 is down 7 fms.; the lode in it is large and promising, and producing saving work for tin. The three stopes in the bottom of this level are worth for copper and tin 25*l.* per fathom each stope. The working of two of these stopes has been materially interfered with by the breaking away of a stull, and which must be replaced before we shall be able again to work them. The new drawing-engine is completed, and in good working condition, together with the necessary erections at the surface. We have also, since last account, put a new skip-road in the engine-shaft, and having drawn through it a week, we have great satisfaction in informing the adventurers that they work and answer well.—W. S. GARBY, J. MAYNARD, J. HOSKING.

SCOTTISH AUSTRALIAN MINING COMPANY.

The half-yearly meeting of shareholders was held at the London Tavern, on Nov. 10,—Mr. A. L. ELDER in the chair.

Mr. GRAINGER (the secretary) read the advertisement convening the meeting. The report was taken as read. It states that—

The sales of coal by this company during the half-year ending June 30 amounted to 67,692 tons, as against 67,170 tons during the corresponding months of 1870. The sales from the Newcastle Collieries generally amounted, the above-mentioned periods to 368,247 and 373,274 tons respectively. From this comparison of the corresponding half-years of 1870 and 1871 it will be seen that whilst the general sales of coal from the Newcastle collieries had somewhat decreased, those from the company's colliery had slightly increased. The profit shown by the colliery profit and loss account amounts to 3984*l.* 10*s.* 9*d.*, the necessary disbursements for maintenance and renewal having been made. A new ventilating furnace, having a very large fire area, and capable of drawing 150,000 cubic feet of air per minute, has been completed at the south pit. Capt. Holman has continued his operations upon the Cadia properties in search of a quartz reef yielding gold in paying quantity. Several crushings of stone have given results which, if they could be obtained upon a large scale, would make the operations highly profitable, one parcel of 7½ tons having yielded 8 1-10 ozs. of gold, but the general average of the stone crushed has been of much less valuable character, and a permanently paying reef, therefore, has yet to be discovered. The balance of profit for the half-year ending June 30, shown by the general revenue account, is 3347*l.* 13*s.* 1*d.* The directors recommend the payment of a dividend at the rate of 5 per cent. per annum on the paid-up capital of the company of 127,500*l.*, free of income tax. This will require the sum of 3187*l.* 10*s.*; and leave to be carried forward to next account 160*l.* 3*s.* 1*d.*

The CHAIRMAN stated that he regretted to have to occupy the chair in consequence of the illness of their able and esteemed colleague and Chairman of the company, Mr. A. W. Young, but he would with their indulgence do his best. He would first give utterance to the truism that the shareholders and directors had no divided interest—that what they all had to do was to get as much as possible out of the working of the company's properties. At present they were entirely dependent upon the results obtained from the Lambton Colliery. The price of coal at present was very low; attempts had been made to raise it by combination amongst the different producers, but these had failed. Mr. Morehead had endeavoured to keep the price at 9*s.* a ton, but others had reduced it until hardly as much as 8*s.* a ton could be obtained. Some of their competitors had actually openly declared that at whatever price Lambton coal should be sold they would sell at 3*d.* ton lower. The present condition of the coal trade was that of the supply being greater than the demand, and they must under those circumstances expect to see a low price prevail for a time. He had every confidence that the growing demand for coal not only in the Australian colonies, but in California, India, China, Japan, would in due time right matters, but in the meantime they must all exercise patience. He had confidence in the future of the company; he held the shares largely, and considered them to be one of his soundest investments. They would observe that the course of the explorations on the Cadia properties was still [illegible]. The results held out inducements to go on exploring, but [illegible]

collection of past losses in connection with these properties made the superintendent and directors very diffident about spending more money on them. These were the reasons that caused them to state the matter in the report in the way they had done. The properties, in fact, seemed too good to abandon working, and yet not good enough to give them sufficient confidence to spend more money in vigorously working them. Since the report was printed further advices had been received from Mr. Morehead, who wrote under date Sept. 7:—"Captain Holman has been in Sydney since I last wrote. He still, notwithstanding that further crushings from Holman's reef have given very poor results, has a very confident expectation that payable results could be obtained by the use of water-power, and strongly recommends that a turbine should be sent out from England." The directors wanted the assistance of the shareholders' opinions upon the matter. As regards other properties of the company, they had given them all the information they could about them. The rental received was small, but most of them were mineral properties, having no great surface value. He was sorry the directors could not give them a higher dividend than 5 per cent., and hoped they might never get a lower one. He would repeat that he and his colleagues had confidence in the future of the company, and moved that the report of the directors be received and adopted, and that a dividend at the rate of 5 per cent. per annum on the paid-up capital of the company (127,500l.) be declared, the same to be payable, free of income tax, on and after Tuesday, Nov. 21.

Mr. Alderman WHETHAM seconded the motion.

A long and general discussion of the affairs of the company then ensued, in the course of which the opinion was commonly expressed that at present the shareholders would not wish to incur the proposed outlay upon the Cadia properties, and that no more of the unproductive properties should be sold without the consent of the shareholders being previously obtained.

After the CHAIRMAN had replied to various questions, the resolutions adopting the report and declaring the dividend were carried unanimously.

The fees to the auditors were voted.

The CHAIRMAN then explained that Mr. Matthew Young, being about to retire from the office of assistant superintendent, and a transfer of the properties of the company becoming thereby necessary, the directors had resolved that they should be transferred into the company's own name. It became necessary, therefore, to obtain authority to exercise the powers conferred by the Companies Seals Act, 1864, and he moved, therefore, "That the company be and hereby is authorised to exercise the powers given by the Companies Seals Act, 1864."

This resolution was seconded and carried unanimously.

A vote of thanks to the Chairman terminated the proceedings.

[For remainder of Meetings see to-day's Journal.]

Royal School of Mines, Jermyn Street.

[FROM NOTES BY OUR OWN REPORTER.]

The annual course of sixty lectures on Mining, by Mr. WARINGTON SMYTH, at the Royal School of Mines, Jermyn-street, commenced this week. We were glad to observe a somewhat larger attendance of students than this important and interesting department has in past years commanded.

Mr. SMYTH, who was received with applause, in the course of his opening observations remarked that sixty lectures on one subject might seem at first sight to be a great many, but the Art of Mining, properly so called, comprised the practical application of many sciences, or at least of particular branches of sciences, to conditions which could not be arrived at without a knowledge also of what had been done by those who had gone before, and an acquaintance with all those peculiar and frequently unexpected physical changes which occur in different countries, and under varying circumstances. The great place of instruction was, no doubt, the mine itself, but young men who had studied without the advantage of actual observation below the surface would find their progress greatly accelerated by a theoretical knowledge of the best processes under ordinary circumstances, and an idea of what had been done under particular emergencies, and under unusual conditions of the earth's crust at the points penetrated. And so a ready and sound knowlege of such science as Geology, Mineralogy, Mechanics, and Physics would largely facilitate the progress of the mining student, and enable him to form useful and probable ideas of the state of things presented to him in actual workings. The art of mining was, in short, a practical grouping of all the processes used to obtain minerals from their natural beds, whether near to or on the surface of the earth, or in the depths below. Workings in the open day were commonly called quarries, and not mines, but in these days many of the processes by which quarries were worked bore essentially the character of mining operations, and in some cases pass from one form to the other, either by original design, or from peculiar circumstances.

"It would be found, then, that by means of geology the student would bring to his work that knowledge of the stratum of the earth's crust as would enable him to judge of the position and probable character of the rock masses with which he had to deal; while mineralogy enabled him to determine the species and varieties of the minerals which come under his notice, their probable value (or, it might be, their want of marketable value), so as to guide the search for those which were desired, and of which the value was ascertained and recognised. The science of Physics was of vast importance in dealing with two of the greatest difficulties of mining—the presence of water, and the presence of noxious and dangerous gases, which interfered so much with proper ventilation, and oftentimes occasioned sad and extensive loss of life. Moreover, the whole safety and existence of most mines depended from hour to hour upon the mechanical contrivances used for securing the shafts, for proping and maintaining the levels, for selecting the best machinery, and for properly placing it when selected, and keeping it in perfect order for pumping and drawing, and all the thousand and one appliances which went to make up good mining. Mechanics also came into play largely in what was called "dressing," or preparing for the market, the ores when obtained from their natural repositories. It frequently happened that ores were disseminated in very minute particles through a large mass of veinstone. Of this family tin was a leading member, and powerful machinery was required to crush the veinstone, and a considerable variety of contrivances were requisite to work away the detritus, and to secure the valuable metal. Gold was another substance of this kind; and they were probably aware that the gold miners of Australia, instead of washing river sand and drift, now employed powerful quartz-crushers. An economical application of mechanical power was of the greatest importance all through the operations of mining. Some ores did not require much dressing, and were sent to the market and to the smelters almost as they came from the mine. Iron and copper were got from ores of this kind. Three or four years ago he had his attention drawn to a mine which was at first laid out to get copper ore, of which a great deal was obtained; but the vein gradually changed its character, the veinstone became impregnated with tin, and the copper to a great extent disappeared. The consequence was that 10,000l. had to be expended in putting up the machinery necessary for dressing the tin ore. One reason why iron ore could be sold so cheaply was that it did not require these later expensive processes; or, to put it in the other way, those iron ores which contained much of foreign matter and impurities would not, at present prices, pay for the cost of dressing, and were not worked at all. The more valuable hematite ironstone was readily detached from the crystalline quartzose matter with which it is associated by a smart blow of the hammer, and is thus ready for sale without any serious expenditure in preparing it for market. It would be obvious, therefore, that in calculating the amount of capital likely to be required for the successful prosecution of any mining enterprise the facts disclosed by the sciences he had named would be of the utmost importance, and, indeed, indispensable if anything like a true estimate was to be formed. The laws relating to mineral property and to mining, which prevail in various countries, had had much to do in forming different systems. In this country everything was left to individual enterprise, regulated only by legal restrictions and requirements, which had for their view the safety and health of the workmen. The right to the mineral beneath here went with the ownership of the surface, and mining being thus in private hands there was great energy displayed, and more speed to get as much as possible out of a given area in a given time, the result being less forethought in the management, and oftentimes an entire lack of consideration for periods beyond the term for which the adventurers held their rights. In the vast mining districts of Saxony, and of the Hartz, the mines were laid out so as to last a great length of time. The profits being limited, a reserve capital enabled the managers to lay out the works so as to include in every year a certain amount of dead work. In other words, the original plan was carried out, although they might come to places nearly or altogether destitute of metal, with the result of meeting further on with richer and more valuable deposits. In England, too, often the levels from whence the richer ores are produced were pushed along without delay, men were crowded into them, and the utmost possible amount realised, while the poorer levels came to a standstill, or at best were only feebly worked, with the result frequently of closing altogether really good mines, which under the continental system would have been working to profit for years longer. If the tenure of mines in England were extended over a longer number of years mining practice would inevitably be improved, as it was only natural that adventurers whose interest extended over 50 years would work more carefully, and with greater forecast, than if they only had 20 years' interest. Indeed, it had been observed that whenever our mines were worked under a longer tenure the rapid system was not pursued, and the management became more like that of the Continent. We probably, however, should get beyond a sort of half-way house between the two systems, because in foreign countries the minerals do not belong to the owners of the surface, but to the Government. The result of this latter system is that nobody works on his own account entirely, or in his own way absolutely, but in such ways and on such plans as have the Government approval. It is also for this reason that there is no country in Europe without its mining college or academy, in which persons are trained so as to be able, if not to direct the operations, to protect the interests of the Government, and see that it has its just dues. Of these schools the most famous are those of Schemnitz, in Hungary, of Freiberg, in Saxony, and of Paris. In this country efforts had been made to establish schools for mining, as, for instance, in Cornwall by Sir Charles Lemon, and in the North of England by Mr. Dewas, but we had nothing like the legalised systems of the Continent.

In our metalliferous districts mines have been generally managed for years past by men who have shown themselves able, skilful, and observant miners. The class called "tributers," who take a certain portion of a mine and work it in their own way, employing their own gang of men, and are paid by a fixed share of the ore, had yielded very excellent managers, not to be excelled so far as practical knowledge and sagacity are concerned. But when special dangers had to be met, as in the fiery collieries, or great depth under adverse circumstances was to be attained, a superior degree of education was necessary. The aid of science must be brought to assist practical skill and practical knowledge. This Institution grew out of the admirable series of collections brought together during the progress of the Geological Survey in the mining districts, consisting not only of mineral specimens, but of models and plans of the modes in which the vast mineral wealth of this country is obtained. These collections, so full of interest, were, however, deemed incomplete unless they were used as a means of education, such as these lectures intended as far as possible to point out to the students the means whereby our mining operations, as well as those of foreign countries, have been and are carried on. From what had been already said it would be inferred that a material consideration in the commencement of a mining adventure would be the terms on which the adventurers obtain the right to get, or "win," the minerals they were seeking. In this country, as a rule, mines are worked by companies, comprising a larger or smaller number of persons, according to circumstances. Very few mines, properly so called, were worked by single individuals, the risks attendant upon mining being so great as to be best met by a combination of interests. Indeed, any man having a large sum which he wishes to invest in mining would only act with common prudence if he did not put all his eggs into one basket, but divided his interest between two or perhaps three undertakings. The nature of ordinary limited liability companies was now well known. The principle had not practically been found to create greater confidence, and, in fact, no combination had been found to work better in the West of England than the Cost-book System. By this plan the liabilities of the companies were duly discharged at stated intervals, and, there being no liabilities, anyone could withdraw if he pleased. On the other hand, if the adventure was a successful one the division of profits was promptly made according to each man's interest. All that was really necessary was to have the system punctually and thoroughly carried out. Every adventurer then knew exactly what he risked, could join or not join, as he pleased, in any new subscription of capital, and never need have the slightest uneasiness as to unknown ills or liabilities ahead. The customs arising out of this system had now become thoroughly legalised by repeated decisions in the courts of law, and were well understood, and suitable to the sort of mining common in Cornwall and the West of England.

The customs of earlier times left a marked impress upon the mining of these later times, often to the disadvantage of the latter. Three hundred years ago mining works were carried out on a very small scale indeed compared with what might be now seen. In those days the principles and practices pursued were to a great extent identical with those on the Continent. One of the oldest books on mining was written by some one who assumed the *nom de plume* of "Agricola;" it was published more than 300 years ago, and a fine copy of it was now in the Museum library. It contained a vast amount of information as to what was done in those days, and illustrated by woodcuts, which, however defective in some respects, gave a remarkably clear idea of the processes described. From "Agricola" they would learn that on the Continent the license to work any given ground was obtained from the law officers of the Government, a preference being given to the discoverer of the vein or metallic deposit sought to be worked. That principle prevailed to this day, not only on the Continent, but to some extent in certain counties of England. When a German discovers a lode he fixes on a certain point at which to commence operations; he then goes to the representatives of the Crown, and obtains what is there called a "maas," or measure, corrupted in Derbyshire and Yorkshire, where it is yet in use, to "meer." The German miner had the first three portions of the mineral won for himself, the next went to the King, the next to the Queen, and then the officers of the Court—cupbearers, masters of the horse, and others are mentioned—came in each for his share. Vestiges of this old custom are traceable to this day in the Peak of Derbyshire, and in some of the wilder parts of Yorkshire, where if a person discovers a lode he puts up a mark, and thereby secures the right to get that mineral for 14½ yards on each side of the mark, that space being "half a meer." He has, however, now to make arrangements by which he must begin working within a given time. At one time, by renewing the mark he could keep alive his rights for an indefinite period; and thus when a company, perhaps, was formed to work a given area with vigour and every proper appliance, an innumerable company of these claimants had to be bought out. The reason such a system was ever practised may be found in the fact that in the districts where it prevails the lodes or veins crop out at the surface, and being free from—or, at least, very little troubled with—water two or three men might work on for years on ores which required little or no dressing for market on a limited taking of this kind. In Cornwall another variety of this kind was called "bounding." If a man discovered a lode he could take possession of it by simply turning over a few sods of turf at each corner of the piece of ground containing the outcrop, or any other indication of the presence of a lode. It frequently happened that the person who did this had no means to work his discovery, if discovery it were, and so he would pass it on to his son or next heir, or sell his quasi right to someone else. The right was retained by maintaining the bounders—a mere process of turning the sods again so as to keep up the mark. Claims of this sort led to frequent litigation, but eventually juries decided that without actual workings this mere process of turning over sods conferred no legal rights. Even to this day, when the profits of mines were divided, the "bounders" in some cases came in for a share. As I have already said, no mine manager ought to undertake the conduct of mining operations without being fully acquainted with all such claims upon the property confided to him. The best arrangements may be neutralised by these old-fashioned practices, and in not very distant days mining to a profit was rendered impossible by the number of claims which the profits had to bear.

THE DIAMOND FIELDS OF SOUTH AFRICA.

GEOLOGICAL SOCIETY OF LONDON, NOV. 8.

"On the Geology of the Diamond Fields of South Africa." By Dr. John Shaw, Colesberg. Communicated by Dr. Hooker, F.R.S., F.G.S.

The author described the general structure of the region in which diamonds have been found. He considered that the diamonds originally belonged to some metamorphic rock, probably a talcose slate, which occupied the heights during a late period of the "trappean upheaval," to which he ascribed the origin of the chief physical features of the country. This upheaval was followed by a period of lakes, the traces of which still exist in the so-called "pans" of the region. The Vaal River probably connected a chain of these lakes, and it is in the valley of the Vaal and the soil of the dried up "pans" that the diamonds are found. The author referred, also, to the frequent disturbance and removal of the diamantiferous gravels by the floods which prevail in these districts after thunderstorms.

"On the Diamond Gravels of the Vaal River, South Africa." By G. W. Stow, Esq., of Queenstown, Cape Colony. Communicated by Prof. T. Rupert Jones, F.G.S.

The author described the general geographical features of the country in which diamonds have been found, from Mamusa, on the south-west, to the headwaters of the Vaal and Orange Rivers. He then indicated the mode of occurrence of the diamonds in the gravels, gravelly clays, and boulder drifts of the Vaal Valley, near Potel, including Hebron, Diamondia, Cawood's Hope, Gong Gong, Klip Drift, Du Toit's Pan, and other diggings. By means of sections he showed the successive deepenings of the Vaal Valley and the gradual accumulation of gravel banks and terraces, and illustrated the enormous catchment area of the river system, with indications of the geological structure of the mountains at the headwaters. The specimens sent by Mr. Stow, as interpreted by Prof. T. R. Jones, showed that both igneous and metamorphic rocks had supplied the material of these gravels. The author concluded that a large proportion of these materials have travelled long distances, probably from the Draakensberg range; but whether the original matrix of the diamonds is to be found in the distant mountains or at intermediate spots in the valleys, the worn and crushed condition of some of the diamonds indicates long travel, probably with ice action. Polished rock surfaces and striated boulders, seen by Mr. Gilfillan, were quoted in corroboration of this view.

Mr. WOODWARD mentioned that Mr. Griesbach and M. Hübner had been over the country described in these papers, and had communicated a map of it to Petermann's Journal.

Mr. GRIESBACH stated that the rock described as metamorphic in the paper was by M. Hübner regarded as melaphyre, and that in some parts of the Vaal Valley the beds of the Karoo formation might be seen *in situ*. He disputed the possibility of any of the gravels being of glacial origin. He was convinced that there were no metamorphic rocks on the western side of the Draakensberg; those regarded as such probably belonged to the Karoo formation.

Prof. TENNANT commented on the large size of the diamonds from the Cape, of which he had within the last few months seen at least 10,000, many of them from 30 to 90 carats each. Some broken specimens must, when perfect, have been as large as the Koh-i-noor.

Mr. TOBIN corroborated the information given by Mr. Stow, and stated that the source of the Vaal was in sandstone, and that it was not until it had traversed some distance that agates, peridot, and spinel were met with. The large diamonds, in his view, occurred principally in old high-level gravels, at a considerable elevation above the river, which had much deepened its valley since the time of their deposit. At Du Toit's Pan, however, none of the diamonds, nor, indeed, any of the other stones, showed any signs of wear; and he considered that at that spot was one of the centres at which diamonds had been found in their original matrix.

Mr. DAINTREE stated that in Australia there were agate-bearing beds of amygdaloid greenstone, similar to those in South Africa, and that he had called attention to their existence in the neighbourhood of the Burnett River, where since then a diamond of the value of 80l. had been discovered.

Mr. MASKELYNE commented on the dissimilarity of the minerals found in the diamond-bearing beds of Brazil from those of Du Toit's Pan or of South Africa generally. He thought that possibly the minerals described as peridot and spinel might be bronzite and garnet, which, however, came from igneous rocks; and the remarkable fact was that with them occurred unrolled natrolite and diamonds in an equally unrolled condition, which was suggestive of their having been due to a common origin.

Mr. WARD gave an account of an examination of some of the rock from Du Toit's Pan, with a view of discovering microscopic diamonds, none of which, however, had been found.

Prof. RUPERT JONES has been equally unsuccessful in the search for minute diamonds, both in sand from Du Toit's, and in ochreous gravel from Klip drift. He pointed out the waterworn condition of the agates from Du Toit's Pan, which showed aqueous action, though there were also several other minerals present in a perfectly fresh and unrolled condition. He thought a careful examination of the constituent parts of the gravel might ultimately throw light on their origin. That fluviatile action was sufficient to account for their presence had already been shown by Dr. Rubridge and others, who had treated of the Grand Plateaux and denudations of the district under notice.

A DAY AT THE COMSTOCK LODE.

BY JAMES A. WHITNEY.

The following is an extract of a paper read before the Polytechnic Association of the American Institute, in which the author sketched at length the incidents of a journey to Virginia City and Gold Hill, and described the operations of ore getting, milling, retorting, &c.

The journey, 21 miles southward from Reno, on the Pacific Railway, is made by stage, and mostly in the night. Virginia City and Gold Hill are the names given to the opposite ends of the settlement above the thus far developed portion of the ledge—Virginia City to the north and Gold Hill to the south. At the latter, among other mines, is located the Yellow Jacket, which furnishes a fine example of the silver mining enterprises of the locality, and the one to which principally the attention of the writer was directed. The shaft is 1150 feet in depth, driven vertically until it strikes the syenite underlying the lode, which latter has a dip of 45° toward the east. Standing 20 feet from the bottom of the shaft is the incline, a tunnel which follows the dip to a distance equal to a further vertical depth of 200 feet. In this incline is laid a track, upon which runs a car holding about 28 cwts. of ore, and moved up and down by a flat wire-rope, 4 inches in width and three-eighths of an inch in thickness. This rope extends up through the shaft to a 9-feet sheave in the roof of the building over the shaft, and thence to a winding drum 14 feet in diameter, worked by an engine at the surface. As the car is drawn to the top of the incline it is automatically dumped into a reservoir having a sloping bottom, with outlet chutes at its lowest part. Through these chutes the ore passes into iron ore-cars holding 1400 cwts., which are run upon elevators or cages, and raised to the top of the shaft by wire-ropes running over sheaves to reels operated by a separate engine, in the same manner as that which works the car on the inclines. At the surface the cars are run from the cages out upon tracks laid on a trestle that projects horizontally from the hill side, so that its outer end is 50 feet from the ground. At the outer end of this trestle are openings, through which the cars dump their contents into a receiver below, holding, when full, about 350 tons of ore. This receiver, like the small one just noted as being at the bottom of the shaft, has a sloping bottom, which causes the material to gravitate towards outlet chutes, through which, on occasion, it is transferred to freight cars of the railway, which convey it to the mills on the Carson river. Of course, the ore from the drifts or tunnels that extend directly from the shaft at different levels is put at once into the smaller cars, and then transported in the manner just described. These cars, in the drifts, move on tracks formed with miniature rails of the same pattern as those used in above-ground railways. The cars are formed with heavy sheet metal bodies and trucks, having angle iron sides connected by wrought plates and by the axles of the wheels, which last are of cast-iron. The cages differ in construction from those used in other mines of the district in being made of skeleton form and of wrought-iron, to secure lightness, their distinctive feature, however, being that they are made with two decks or floors, one above the other, so that two ore cars instead of only one may be raised at each hoist. It is proposed to secure a still further reduction of weight, both in cars and cages, by substituting steel for iron in their construction. The reel-shaft from which the cages are worked is fitted with an ingenious device that indicates the exact position of the cage at any portion of the shaft of the mine, and a rope extending up and down in the latter enables a person upon the cages to signal the attendants above to stop at any desired level. Similar adjuncts are provided in connection with the mechanism that actuates the cars on the incline. In the lower levels the heat is intense, 110°, and the miners, mainly Cornishmen, work only from six to eight hours daily, for which they are paid $4 per day in gold. Of coure, in order that operations may be continuous, different gangs work in the shafts alternately. The method of treating the wire-rope upon which the hoisting depends, so as to protect it from corrosion and undue wear and tear, is probably the most efficient known. The ropes removed from their places are wound each upon a drum about 3 feet in diameter, and arranged at one end of a trough 20 ft. long, and half filled with melted tar, having mingled with it about 5 per cent. of tallow. The rope is wound from its drum, and passing through the tarry material, is wound upon a second drum at the opposite end of the trough, being, as it passes through, scrubbed with a wire brush to detach the hardened coating previously applied. The ropes are treated in this manner once a month. The writer described the operation of the stamp-mills, amalgamators, retorting apparatus, &c., of a small milling apparatus establishment in the immediate neighbourhood of the Yellow Jacket; and also sketched his general impressions of the locality, closing with an appreciative remarks upon the bluff and cordial courtesy of all whom he came in contact in the most noted mining camp of the remote West.—*Engineering and Mining Journal* (New York).

OUR RAILWAY SYSTEM VIEWED IN REFERENCE TO INVASION.

It is probable that Mr. Mallet could scarcely have rendered a greater service to the country than by the publication of Baron von Weber's pamphlet on "The Training of Railways for War in Time of Peace," with his own introduction to it.* It is gratifying to find that so excellent an authority as Weber expressed a very favourable view of the British railways as compared with those of Germany, but that does not alter the fact that they are still far from perfection. The main drift of Weber's pamphlet is, Mr. Mallet states, to urge that every simplification, every uniformitisation of the materiel, of the personel, and of the system of working railways which can be made will be beneficial to their effective uses in time of peace and in time of war must prove *a fortiori* of, we may truly say, incalculable value to the State, and, therefore, to every individual composing it in the aggregate. It is remarked that if used to the best advantage, and in combination with an efficient railway system, railways enable the whole power of a State, however great its territory, to be thrown with lightning rapidity upon a given point; they tend, also, to limit the area of actual conflict, and to reduce its duration; the experience of the last fifteen years proving that campaigns which, under the greatest military geniuses of older times, would have extended to months, or possibly years, are inevitably settled in a few weeks, or in even a few days. The darker side of the picture is undoubtedly the immensely increased power of sudden aggression, and the strong tendency that the possession of such a power is pretty certain to produce in all the great military monarchies to attack and overpower their weaker neighbours—the tendency which Prussia has abundantly evinced since 1864 to "make might right."

Much that Mr. Mallet states in his introduction (which by the way is rather longer than the pamphlet he translates) is no doubt true, but in some cases he seems rather to have overdrawn the difficulties to be encountered. He points out that the advantages of railways are, of course, greater when long distances have to be traversed, and that an army corps can actually march from 15 to 20 miles in as little time as it will take to embark it and disembark it in railway trains, and to carry it at railway speed the same distance. What can be done, he observes, on our own British lines has in reality never yet been tried; and like everything else that regards our defence, will probably be postponed until it be too late. Our transports of volunteers and of spectators on a few review days are no criterion at all, for volunteers are only men in uniform, with rifles in their hands, and with a few rounds of blank ammunition. They have never yet been placed in the conditions of a corps d'armée in actual warfare; they have scarcely any artillery, scarcely any cavalry, no stock of food, no ponderous supply of ammunition, no wagon train, neither pontoons, nor entrenching tools, no field hospitals, no tents, or camp equipages—in a word, not one of the many formidable, but necessary, impediments belonging to a real force taking the field in real warfare, and which are the very things that prolong embarkation, produce confusion, and delay departure by rail. In truth, volunteers, as regards the point before us, can only be regarded as so many excursionists for a day with arms in their hands instead of fishing-rods or umbrellas.

That volunteers would require both food and ammunition to make them useful is beyond question, but Mr. Mallet seems to assume an attack instantaneously and without notice, and an utter inability of an English force to remain upon the field awaiting the battery trains, ambulances, and subsistence columns, as long as with the theoretically excellent German system they are compelled to wait. Mr. Mallet shows, moreover, that the Brighton line were enabled to carry 120,202 passengers in a day irrespective of the 12,000 volunteers, so that it is only fair to assume that had these 120,202 undisciplined travellers been absent there would have been no trouble in carrying (say) 50,000 disciplined passengers with the necessary war material in the same time. Properly, we think Mr. Mallet gives the preference to the French system of dispatching each portion of a division or corps as it arrives at the station without reference to the order in which it will take position in the field when disembarked, rather than to the Prussian system of making the order of dispatch correspond with that of relative position in the field. He shows that the weight of a battalion of infantry is very nearly the same as that of a squadron of cavalry, or 120 to 125 tons; that of a battery of field artillery or an ammunition column about 200 tons. So that in Prussia a division of 12,000 men will require 30 trains, and a single army corps from 100 to 114 trains. Mr. Mallet observes that whenever England shall be engaged in war upon foreign soil, or by sea only, were that possible, our railway system would be called upon to perform important tasks in the conveyance of troops and materials to our ports for embarkation, probably in conveying back sick and wounded, and possibly in conveying prisoners into depôts in the interior, and these may occasionally involve a more or less serious pressure along particular lines. What we really have to look to, and ought to consider in all exactitude and detail, is how our railway system shall be made the very most of, as one part of a great co-operative machine for repelling foreign invasion from our shores.

After Mr. Mallet's introduction, Freiherr Von Weber's pamphlet will be read with much increased interest, and the value of the minute details given will be thoroughly appreciated. The Defence Duty of Public Institutions is first considered, then the security of the war service of railroads, next the preparation of railroads for war service, and, lastly, the organisation of railways for the construction and repair of war material, much, however, of which appears to have but little bearing upon the military matters of this country. The pamphlet and introduction together will prove extremely valuable, but we should attach by far the greater importance to Mr. Mallet's introduction.

* "Our Railway System viewed in Reference to Invasion." With an Introduction and Notes. By ROBERT MALLET, M.I.C.E., F.R.S. London: Chapman and Hall, Piccadilly.

A map of Cornwall, which is published as a frontispiece of Mr. Spargo's work, entitled "The Tin Mines of Cornwall," is now before us, and we are doing bare justice to Mr. Spargo in pronouncing it to be exceedingly beautiful, and discriminatively accurate. The whole county is depicted with preci-

sion, and by lines and colour the various seats of great mineral deposits are shown. The granite regions are brought out boldly, and their surrounding lines of metallic lodes marked with an accuracy severely strict, and affording instruction to geologists, mineralogists, and practical miners. The lover of topographical studies must feel deeply interested in its well defined orological delineations; and it is well for residents or travellers to be able to see at a glance the peculiarities of country, the relations of locality, and the distribution of the wonderful mineral resources of this extraordinarily prolific little promontory. The work with which this map is connected is so elaborate that we defer our notice of it until next week.

RUDIMENTARY TREATISE ON GEOLOGY.—A few weeks since reference was made to the publication of the first part of a Rudimentary Treatise on Geology, by Mr. Ralph Tate, and the second part* has now been issued. The volume is arranged in an admirable manner for the use of students. The subdivisions of geological time is followed by an excellent palæontological summary, arranged under the heads of fossil botany and fossil zoology, and the various systems forming the several epochs are treated of in the ascending order. The illustrations are very numerous, and materially facilitate the comprehension of the descriptions given; whilst the excellent index with which the book is furnished renders it particularly easy to obtain any desired information from it. The volume, as a whole, is unsurpassed by any of similar size with which we are acquainted.

* "Rudimentary Treatise on Geology. Part 2, Historical Geology." By RALPH TATE, F.G.S., &c. London: Lockwood and Co., Stationers' Hall Court.

FOREIGN MINING AND METALLURGY.

The state of the coal trade remains unsatisfactory in the large towns and industrial centres of France, in which the blast-furnaces and rolling-mills find themselves compelled to slacken their production in consequence of the want of combustible. The coalowners suffer, of course, from the forced inactivity of consuming industry, and from all sides the most bitter complaints come to hand with reference to the transport question, or rather the want of transport question. The subject of the canalisation of the Meuse, which is considered to be becoming of urgent importance, having regard to the activity of traffic in the East of France, is seriously under consideration. The Bar-le-Duc Chamber of Commerce has voted a subvention of 40*l.*, in order to push forward the surveys and the project generally. The Nancy Chamber of Commerce has offered a similar subvention, and the Decize Saltworks Syndicate 200*l.* It is hoped that 400*l.* may be obtained from the iron trade of the Meurthe, and an equal sum from colliery proprietors in the Charleroi and Liége districts. The extraction of coal effected in the first half of this year in the sub-arrondissement of St. Etienne amounted to 11,703,000 metrical quintals, and in the sub-arrondissement of Rive-de-Gier to 2,329,000 metrical quintals, making an aggregate of 14,032,000 metrical quintals. The corresponding aggregate for the first half of 1870 was 17,869,000 metrical quintals. The Rive-de-Gier Collieries Company will pay, on Monday, a dividend of 1s. 3d. per share.

Prices of coal have not varied in Belgium; they remain firm, with an upward tendency. Orders come to hand in great numbers, but they can be executed only partially, in consequence of the continued want of means of transport, both by land and water. Freights to Paris have attained quite an exorbitant level. The position of the collieries and of their working population during the ensuing winter is grave and disquieting, and calls for the special attention of the Government within the shortest possible period. A meeting of a number of leading Belgian colliery proprietors and of Longwy forgemasters has been held at Brussels, under the presidency of Baron d'Adelsward. The meeting was called by forgemasters of the Moselle group, to enable some understanding to be arrived at, if possible, with the colliery proprietors on the subject of the difficulties which the present state of the Longwy group presents, in consequence of the disorganisation of means of transport on the Luxembourg Railway. Several furnaces are extinguished, and others cannot be lighted, in consequence of the impossibility of relying upon a regular current of traffic between the collieries and the works. The principle of hiring the wagons required by the firms interested was adopted by the meeting, which considered it apparently useless to confide to the goodwill of the railway companies and State authorities. The Basin of Charleroi United Collieries Company has been paying a dividend for 1870-1 of 16s. per share.

The French Government has been at last impressed with the general and incessant complaints of industry; and in a letter addressed to the Society for the Development and Defence of the Commerce and Industry of Marseilles, Vice-Admiral Pothuau, charged *ad interim* with the Ministry of Public Works, announces that he has restricted within the shortest possible limits the period prescribed for the conveyance and delivery of goods on railways. In order to assist the companies in keeping their engagements, Admiral Pothuau has increased the warehousing dues authorised to be charged at stations; he has also authorised them to cart away officially such goods as may not be removed within a given time. The Administration of the Austrian State Railways has followed the same example, and has reduced by two days the period prescribed for warehousing goods in the Pesth station, which is always much blocked up. One can scarcely blame the companies for endeavouring to enforce severe regulations, in presence of the complaints with which they are overwhelmed. The transport question, it will be seen, is far from being fully adjusted in France, and its influence upon the iron trade remains unchanged; there are always complaints, and always great reasons to complain. Nevertheless, working operations are being pursued with energy in many directions, and although France has a good deal to do at home, she, nevertheless, finds time to engage in sundry constructions on foreign account. The concern known as the Forges et Chantiers de la Mediterranée is building at present a floating workshop for Austria, and some St. Etienne works have sent in tenders to Hanover for the delivery of wheels, axles, and springs. The Vieille-Montagne Company is establishing in France some new works, to which it will remove the workmen of its St. Leonard establishment, which will be closed as from Dec. 31. There are also rumours as to a very important project for transforming the Creusot Works into a great cannon manufactory; it is stated that only comparatively small sacrifices would have to be made in order to put Creusot into a state in which it would rival the famous cannon foundry of Herr Krupp. The Montataire Forges and Foundries Company has been paying this week a dividend for 1870, or 1*l.* per share.

In connection with the railway transport question in Belgium, it is satisfactory to note that the Minister of Public Works has just informed the Communal Council of Antwerp that 1224 wagons in course of construction are nearly completed, and that a portion of these wagons will be shortly forwarded to that town. It is to be hoped that this reinforcement will bring some relief to industry, which would otherwise be in an excellent position. The Belgian Railways Working Company has obtained a contract for 500 pairs of wheels for the Royal Sarrebruck Railway; and most of the Belgian works have received proposals for the repair in their workshops of the damaged and worn out rolling-stock of the State system. Last year offers in this direction were made to the State by some mechanical establishments which were then only indifferently employed, and their offers were rejected. Now circumstances have changed. The State has annexed to its network 379¼ miles of additional line, with a corresponding quantity of plant; as its repairing shops have not experienced a corresponding extension, it now finds itself under the necessity of encouraging the offers which it formerly refused. Unfortunately for the State, the Belgian mechanical firms are now overdone with work, and find it necessary in their turn to decline the propositions made to them; at any rate, if they accept them they will stand out for much higher prices. A strike of working mechanics at Gand has terminated; the men will work ten hours per day, at an advance of 10 per cent. in their wages. The masters, in case of necessity, are empowered to require that the working day shall be carried from 10 to 12 hours; the two supplementary hours will be paid for at the same rate as the ordinary hours. Night work and Sunday work will be allowed for at the rate of three hours for two hours of effective work. The smiths of Antwerp are stated to have gone on strike; they demand a very considerable advance in their wages. The men employed on the Thuringia (Germany) Railway have struck. A railway strike has also occurred at Mayence. Letters from Vienna state that England, France, Belgium, and Germany competed for the construction of a great iron building, which is to accommodate the Vienna Universal Exhibition, in 1873. Amongst the establishments which were invited to submit tenders were the Fairbairn Engineering Company (Limited), the Butterley Company, the Forges et Chantiers de la Mediterranée, MM. Schneider and Co., of Creusot, the Fives-Lille Company, the Cockerill Company, of Seraing, Herr Harkort, of Westphalia, and some other firms. The English firms appear to have been completely distanced by the continental works; France, Belgium, and Prussia remained almost in a line; but Herr Harkort obtained the contract, engaging to complete the building by Oct. 1, 1872. An interesting circumstance in connection with the Vienna Exhibition building is that an Englishman will supply the plans for it—Mr. Scott Russell. M. Charles Louis Carels has obtained a contract for the construction of 11 tank locomotives for a Hanoverian railway.

Chilian copper has been dealt in at rather higher rates at Havre. For 55 tons of disposable first marks bars 74*l.* per ton has been paid, Paris conditions. A lot of 10 tons Lake Superior, Franklin mark, has also changed hands at 82*l.* per ton, Havre conditions. At Marseilles, Spanish copper has made 72*l.*; refined Chilian and Peruvian, 78*l.*; rolled red copper in sheets, 83*l.*; ditto round, 86*l.* The position of the German copper markets has been favourable; at any rate, the upward movement has become more and more decided. In Holland there is scarcely any change to note in copper. The Marseilles tin market has remained without change; at Havre there has been no great amount of business passing in tin. The German tin markets have presented a favourable tone. At Rotterdam prices have further advanced, Banca having been carried from 81¾ fls. to 84 fls. The transactions of the last few days have been very considerable, consumers having purchased largely. Disposable Billiton has made default at Rotterdam. A slight improvement has been noted in lead at Paris; French has made 19*l.*; Spanish, delivered at Havre, 18*l.* 8s.; English, Belgian, and German have brought only nominal rates. At Havre soft Spanish, first fusion, has been dealt in at 18*l.* 16s. to 18*l.* 18s. per ton. The German and Dutch lead markets have presented little change. Silesian zinc, delivered at Havre, is quoted at Paris at 20*l.* 8s.; and other good marks at 20*l.* per ton. In Germany zinc has been firm, especially at Breslau.

FOREIGN MINES.

DON PEDRO NORTH DEL REY (Gold).—Telegram from Lisbon: Produce for September, 14,054 oits.; weighed to October 18, 4958 oits.—Comparison: September month, 14,054 oits.; first division of next month, 4958 oits.; previous month, 14,900 oits.; first division of next month, 5700 oits.; corresponding month last year, 5364 oits.; first division of next month, 1396 oits.

ALMADA AND TIRITO (Silver).—The directors have received the following telegram from Mr. Clemes:—September, profit for month, $6549.

PACIFIC.—H. Prideaux, Oct. 23: Since my last report we have raised from the mine about 20 tons of ore. This is on an average richer than any ore yet being raised—that is, since I have taken charge of the mines. There has been since my last 6 tons of ore assorted from the dump. We have sunk a winze 25 ft. through the ore that was cut below the 400 ft. level; it has continued rich the entire distance, and is looking well in the bottom. I have commenced to stope the ore in the west end of this winze. The east stope, in back of the 550 ft. level, is yielding ore of a good quality. In the west stope, in back of the 550 ft. level, there is a large ledge, and the ore is of a fair quality. There is no alteration in Nos. 6 and 7 stopes; these stopes are producing rich ore, but not in large quantities.—North Cross-Cut. Batters's Ledge: The ore taken from this ledge is richer in silver; this is a very large and promising ledge. Since my last, which was dated Oct. 16, we have sent from the mine to the Mettacom Mill a little over 30 tons of ore.

SOUTH AURORA (Silver).—The directors have received, per steamer America, six bars of silver, value $6740 39 cents., from their mines.

The directors have also received, per steamer Hermann, nine bars of silver, value $10,540·3, from their mines.

PINTO (Silver).—The directors have received a telegram from their agent at the mine stating that the reduction mill has been delivered over to the company by the contractors in working order some days within the stipulated time. The 8000 unallotted shares of the company will now be issued rateably amongst the shareholders.

UTAH (Silver).—The directors have received the following advices from their resident secretary, dated Oct. 27:—In sending a cable message it is necessary to visit Salt Lake, and this, of course, involves an expense. I will in future send you a weekly telegram, as requested. The new furnace will be completed next week, and Capt. Nancarrow anticipates great results from it. We have enough ore of all grades, worth smelting, to run three furnaces. The first run after my arrival commenced on Sept. 24, and continued up to Oct. 7, the produce being 359 bars of bullion. The furnace re-commenced running on Oct. 11, and has produced up to this date, inclusive, 634 bars; average weight of bar, 117 lbs. About 40 tons have been sold by Capt. Nancarrow during his present visit to Salt Lake, and I have shipped 200 bars to Sandy Station within the last three days. At present the furnace is running well, the ore is improving in the Red Warrior, a new double shaft, 12 ft. square, has just been let by contract, and is 11 ft. down; the contract in the main tunnel, now 320 ft. long, is completed, and I am pleased to say that coal is coming in very fast. This is of greater importance to us than you can estimate at home. Fires have been raging throughout the country. Col. Johns, who offered us 60,000 bushels of charcoal at a low rate, has lost the whole of it in the cord. This canon is almost bare of timber, and a large portion of our coal comes from Nevada. All the smelters are competing for a supply of coal. We have got 30,000 bushels at Sandy (I went there yesterday), and about 10,000 tons on the works here. The following telegram has been received, dated Nov. 15:—Ore raised (week ending Nov. 11), 190 tons; smelted, 71 tons, which has produced 26 tons bullion (value as per last sale in Salt Lake City, 132*l.*). Total value of ore when smelted, (say) 800. Total cost (inclusive expense of new furnace), 74*l.* Furnace running well.

ECLIPSE (Gold).—Mr. Henry Tregellas, Oct. 19: Since writing you on the 3d inst. all hands in this employ have been engaged in deepening our water ditch. As I then stated, the river had not been so low in 10 years, but I am happy to inform you that by making the ditch deeper we now have water to drive 30 stamps, and while I write the whole machinery is in operation, having finished the ditch this morning. We shall now, I hope, continue steadily on, for I know of no cause for let or hindrance. The contractors for the smelting-furnaces are hard at work on them. I believe that our troubles are over, and that we have a bright future before us. I will now, in future, send you reports twice each month.

Telegram, under date Nov. 3, from Mr. Henry Tregellas: Stamped, 100 tons; yield in free gold $2500. Same remitted reliance. Machinery highly satisfactory.

EXCHEQUER (Gold and Silver).—Lewis Chalmers, Oct. 23: I wrote you last 9th inst., and had telegram from Bank of British North America on 11th advising remittance, and was unable to send my usual weekly on the 15th, being in Virginia city on the hunt for men. Sawing will be finished on Saturday, perhaps sooner. The cattle are still hauling logs to the saw-mill. The ore shoot will not be finished before Saturday. I hope on Monday next to commence stamping, when I will continue to push things as hard as I can. I have been trying to get another team on hire to haul ore to the mill, but as yet unsuccessfully. I think I have succeeded in getting good men for the quartz mill. During the week ended Oct. 21 the men were occupied the first three days in placing sills for the ore tramway, and grading in connection therewith. The ox-team having to haul logs I was obliged to put the men back the balance of the week, as I could not send them the timber they required. The drift in rise on the 140 feet level was pushed in 3½ ft. south. The pay ore is 3 ft. wide at this place; north 4 ft. were made: 6 tons of ore were raised from these two places, and 1600 lbs. of ore taken from the rise from the main tunnel. Last week the drift south of rise from the 140 was put in 5 ft. in four days. The ledge in the face of the drift is 2 ft. wide. The stopes in the lower level produced in four days 8 tons, in the upper 5 tons: 100 ft. of ore tramway was finished. I am so busy now pushing things ahead you must not expect long reports. Bullion will be more satisfactory, and you shall have it.—P.S. To-day we have struck some fine ore near the shaft.

BATTLE MOUNTAIN.—Captain Richards, Oct. 25: Virgin: In the 113 fm. level north we have taken down some of the eastern side of the drift, and find good stones of rich ore; this drivage will now be pushed forward to prove the piece of ground between Moore's winze and Truscott's winze, both in the bottom of the 73 ft. level north, and which is a very important point, and promises to be valuable. In the 73 ft. level north the lode is assuming a very encouraging character, and during the past week has produced some green carbonate, and rocks thickly impregnated with red oxide and native copper—prospects of a most encouraging character. The stopes in the back of the 113, north of Roach's winze, produce some rich ore, but the gangue therein interferes with the value; but it is a fairly productive lode. The lode in the stopes in this level, south of Roach's winze, is producing some rich ore, and is a fine lode. The stopes (Pascoe's) in the back of the 37 feet level north contain branches and pockets of exceedingly rich ore, and pays well for stoping. Ore raised during the last two weeks, 878 sacks.

WEST CANADA.—Oct. 24: At the Wellington Mine the two stopes under the 40 fm. level are yielding 2¼ and 2¾ tons of ore per fathom.—Copper Bay: The lode in the 60, east of Bray's shaft, is a little larger than last reported, and will yield 1¼ ton of ore per fathom. Nothing has yet been met with in the cross-cut driving north at the 50, west of Palmer's. The stope under the 50, west of this shaft, yields 2 tons per fathom, and that under the 50 east, 2½ tons. The stope in the back of the 35, west of the same shaft, yields 3 tons per fathom. Two stopes in the bottom of the 35, east of Bray's shaft, give 2½ and 3½ tons per fathom, and one in the bottom of the 35 fm. level west 2½ tons per fathom.

LUSITANIAN.—T. Chegwin, Nov. 7: Palhal: In Taylor's engine-shaft, below the 150, the lode is 5 feet wide, yielding 2 tons of ore per fathom.—Levels on Basto's Lode: In the 150, east of Taylor's shaft, the lode is 2½ feet wide, worth ½ ton per fathom; the end has become very wet, and we hope soon to have a better lode. In the 150 west the lode is 4 feet wide, worth 1½ ton per fathom. The lode in the 140 east is 5 feet wide, composed of quartz and country, and in the same level west it is of the same size, containing schisto and quartz, and yielding 1 ton of ore per fathom. In the 130 east the lode is 5 feet wide—poor. In the 120, east of River's shaft, the lode is 10 feet wide, composed of quartz and stones of ore. In the 110 east the lode is 4 feet wide, unproductive. The 90 east is 2½ feet wide, composed of schisto and small stones of ore, and the 70 east is 9 feet wide, composed of soft country and quartz, spotted with lead. The 60 east containing a quartz lode 1½ feet wide, has been suspended, and the men removed to the 130 east. The lode in the adit, west of Percy's shaft, is small, but has some rich ore in it. The mill lode at the 38, east of Taylor's, is 1½ feet wide, composed of schisto. The branch at the 38, west of slide lode, is subdivided into smaller branches, none of which are productive. In the rise above the 90, east of River's shaft, the lode is 3 feet wide, yielding stones of ore. The winze below the 140, west of Taylor's, is going down on a lode worth 1 ton per fathom. The winze No. 88 has reached the 38, west of the cross-cut; the lode is small and unproductive. The 130, west of Taylor's, on the slide lode, contains a lode 2 feet wide with stones of ore in it.—Carvalhal: The ground in the 60 fm. level cross-cut, north of Incline shaft, is a hard gneiss, with a little quartz on the eastern side.—Great Lode: In the 130, east of Incline shaft, the lode is 3½ feet wide, composed of quartz and stones of lead. In the 20 east it is 8 in wide, composed of quartz and country, and letting out water.—Caunter Lode: In the adit level and the 10, west of Incline shaft, the lode is 1 foot wide, and of no value, but in the 20 west the lode is worth 2 tons of lead ore per fathom, and in the 30 west the lode, which is 2 feet wide, produces stones of lead.

[For remainder of Foreign Mines see to-day's Supplement.]

CANADIAN GOLD FIELD.—Mr. Lindsay D. Simms, of Fort Garry, who has just reached St. Paul, from Manitoba, brings information that intense excitement prevailed at Winnipeg over recent gold discoveries at Lake Shabondawan. Many specimens of gold dust, nuggets, and gold-bearing quartz had been brought to Fort Garry, and hundreds at once repaired to the scene of the discoveries. The Government of the Dominion of Canada is engaged in establishing a road between Fort William, on Thunder Bay, and the settlements on the Red River Valley, but all work on this thoroughfare has been entirely suspended, the workmen, to the number of several hundreds, having dropped their shovels, picks, and axes, and emigrated in a body to the gold fields, where they were each washing out with their hands $4 a day and upward. The early explorers of a route through the British possessions discovered gold and silver in this vicinity, and later investigations have shown that vast deposits of minerals are to be found along both shores of the great lake. Lake Shabondawan lies about 40 miles due west from Fort William, and at least 400 miles from Fort Garry. This lake is only about 10 miles in length, and but 2 or 3 in width, and forms one of many small bodies of water in that section. It is bounded on the south and west by a mountainous and broken country, through which flows several small and rapid streams. Lake Shabondawan is but a short distance from Silver Islet, in Lake Superior, said to be the richest mine in the world, and not over 150 miles distant from the copper mines of Ontonagon. There are, therefore, reasonable grounds for believing that these discoveries may prove to be as valuable as they are reported, and that the extensive prospecting of experienced gold-hunters, which is sure to follow, may yet develope mineral resources north of Lake Superior as vast as those which have attracted hundreds of thousands of people to the western slopes of America and the islands of the Pacific.—*St. Paul (Minnesota) Press.*

EAST SETON.—The following is a copy of the report of Capt. Wm. Pascoe, the newly-appointed manager of this mine:—

Nov. 6.—Basset's engine-shaft is sunk 4½ fathoms below the 46 fathom level; the lode is 4 feet wide, at present unproductive; sinking by six men and three boys. This shaft we shall put down with all possible speed, the great object being the junction of the lode with the elvan course. The 46 fathom level is driven east of shaft 5 fms; the lode is 2 feet wide, composed of quartz, mundic, and blende, with a little copper ore; driving by six men. This end will be driven on with all possible dispatch, in order to drain and open communication with the eastern or flat-rod shaft, where we may fairly expect some good results, being parallel to where North Crofty was so productive for copper; and on the same lode now so productive at West Tolgus. The 46 fathom level is driven west of shaft 4½ fathoms; the lode is 3 ft. wide, of the same composition as the eastern end; driving by four men. It is desirable that this end should also be driven with all speed, to open a communication with Cartwright's shaft. We are driving a cross-cut south at this level, to cut a branch or lode gone down at the 20; we have about 2 fathoms further to drive to intersect it. The 34 fathom level is driven east of Cartwright's shaft 15 fathoms on the south part, which is at present poor; but there is a part of the lode standing to the north which it will be desirable to open on to prove that part of the lode. There is a stope in the back of the 27 fathom level, east of Cartwright's shaft, producing 2 tons of good ore per fathom; stoping by four men.—Cartwright's Shaft: The men are now engaged in cutting ground for bearers and cistern, preparatory to fixing the lift at the 34 fathom level. The fixing of the lift and putting bob and flat-rods at surface will be done as fast as possible, in order to fork the water and to resume the sinking of this shaft, which is a very important point, and to be enabled to work the ore ground in the bottom of the 34. It is my intention to sink as rapidly as possible both the sump-shafts (Basset's and Cartwright's), in order to meet with the junction of the lode with the elvan course, which we expect will be reached about the 60 or 70, and which has been so productive at Wheal Seton and West Seton Mines, producing some of the best courses of ore in the county, and I think similar results in East Seton may fairly be expected.

ST. JUST AMALGAMATED, at present, has 50 pitches working on tribute, at tributes varying from 5s. to 15s. in 1*l.* They have had a splendid run of tin ground on the junction of the killas and granite at the 90 and 100 fathom levels, worth occasionally 30*l.* and 40*l.* per fathom.

SOUTH CARN BREA.—This mine has lately excited great attention. On Friday, which was inspecting day, 19 mine agents again went underground. Their unanimous opinion is that a richer discovery has not been made in any Cornish mine since the best days of Wheal Buller, Wheal Basset, and other great mines of the neighbourhood.

SOUTH CROFTY.—This mine has been inspected all through, both on the surface and underground, by Capt. Josiah Thomas, who is appointed the manager, and his report on the mine is sufficiently favourable to determine the committee, at their meeting held on Monday, to recommend the adventurers at once to erect sufficient machinery for stamping and returning the tin; and a special meeting of the adventurers will be held on Monday next to approve and confirm the committee's recommendation.

SALE OF MINE SHARES.—On Friday, Nov. 10, the following shares were sold by auction, at Tabb's Hotel, Redruth, by Mr. John Thomas:—5 North Crofty at 29s.; 5 Perran Wheal Virgin at 15s. 9d.; 2 Carn Brea at 148*l.* 10s., and 1 at 148*l.* 5s.; 1 Tincroft at 61*l.*; 2 West Chiverton at 18*l.* 11s.; 10 Perran Wheal Virgin at 16s. 9d.; 3 West Tolgus at 18*l.*, 18*l.* 5s., and 18*l.* 1s.; 2 Emily Henrietta at 12*l.* and 11*l.* 10s.; 3 Comford at 4*l.* 2s. 6d.; 10 Uny at 9*l.* 15s., and 5 at 9*l.* 16s.; 3 East Basset at 10*l.*; 10 Perran Wheal Virgin at 16s.; 2 Poldice at 3*l.* 12s. 6d.; 5 West Frances at 30*l.* 5s., 1 at 59*l.* 10s., and 1 at 59*l.* 2s.; 10 South Carn Brea at 7*l.* 9s., and 10 at 7*l.* 8s. 6d.; 1 South Frances at 60*l.*; 2 Cook's Kitchen at 39*l.* 2s. 6d.; 5 Rosewall Hill at 18s. 6d.; 2 Wheal Seton, 22*l.* There were 3 East Lovell and 5 Trelyon shares offered for sale, but no offer being made they were withdrawn.—At Mr. T. T. Wheal's auction sale of mining shares, at Abraham's Hotel, Camborne, on Saturday:—5 Leeds Tin Mine at 9s. 6d., and 5 at 9s.; 1 West Frances at 30*l.* 10s., and 1 at 30*l.* 12s. 6d.; 1 Wheal Buller at 32*l.* 5s.; 5 East Seton at 29s.; 1 North Roskear at 19*l.* 15s.; 1 Carn Brea at 147*l.* 15s., and 1 at 146*l.* 15s.; 1 West Frances at 30*l.* 10s.; 1 Pendarves United at 53*l.*; 10 Wheal Osborne at 4*l.*; 1 West Frances at 30*l.* 10s., and 1 at 30*l.* 8s.; 1 South Crofty, at 31*l.* 5s.; 1 Cook's Kitchen at 39*l.* 12s. 9d.; 2 East Basset at 10*l.* 8s. 6d.; 1 New Seton at 53*l.*; 10 South Carn Brea at 6*l.* 13s.; 1 South Crofty at 30*l.* 17s. 6d.; 1 North Roskear at 20*l.* 1s., and 1 at 19*l.* 15s.; 1 Wheal Seton at 21*l.* 10s.; 5 North Crofty at 31s., and 5 at 31s.; 1 West Frances at 30*l.* 7s. 6d.; 1 Cook's Kitchen at 39*l.* 10s., 1 at 39*l.* 12s. 6d., and 1 at 39*l.* 12s. 6d.; 1 South Crofty at 30*l.* 12s. 6d., 1 at 30*l.* 10s., and 1 at 30*l.* 7s. 6d.; 1 Tincroft at 61*l.* 10s.; 1 Wheal Seton at 20*l.* 10s.; 10 South Carn Brea at 6*l.* 15s.; 1 South Crofty at 31*l.*, and 1 at 30*l.* 15s.; 20 South Carn Brea at 6*l.* 12s.; 1 Cook's Kitchen at 39*l.* 10s.; 5 Calvadnack at 3*l.* 10s.; 5 Wheal Florence United at 2*l.* 10s.; 1 Cook's Kitchen at 39*l.* 10s., and 1 at 39*l.* 7s. 6d. The sale was a brisk one throughout, and there was a large and respectable company.—*Cornish Telegraph.*

COPPER—(Messrs. J. Pitcairn-Campbell and Co., Liverpool).—Encouraged by the improved statistical position of copper, speculators have been attracted to the article, and an unprecedentedly large business has been done since our last, at an advance of 2*l.* to 3*l.* per ton on Chili bars, and 3*l.* per unit on ore and regulus. The English smelters have advanced their official quotations 2*l.* per ton, and the market closes very strong. Quotations are 69*l.* 10s. to 71*l.* for Chili bars; 14s. to 14s. 3d. for ore and regulus; 15s. 6d. for Corocoro barilla; and 76*l.* to 78*l.* for Chili ingots. Business transacted during the fortnight comprises about 2650 tons bars here, at 67*l.* to 70*l.* per ton; 1200 tons bars at Swansea, at 67*l.* to 68*l.* 10s. per ton; 2550 tons bars, to arrive with extra prompt, at 68*l.* to 71*l.* per ton; 4130 tons ore and regulus, at Swansea, at 13s. 9d. to 14s. per unit; 850 tons regulus, to arrive here, at 13s. 10½d. per unit; and 122 tons Cobija barilla, at 14s. 9d. per unit. Arrivals here during the fortnight of West Coast, S.A., produce:—Garonne, from Valparaiso, 390 tons bars, 367 tons ingots; Mendoza, from Carrizal, 700 tons regulus; Oriente, from Valparaiso, 45 tons bars; Cordillera, from Guayacan, 320 tons bars, 180 tons ingots; Imuncina, from Valparaiso, 30 tons bars; Hector, from Lota, 700 tons bars; Tenby Castle, from Lota, 480 tons bars. At Swansea, Rose of England, from Taltal and Paposo, 408 tons ingots, 185 tons barilla. Stocks of copper (Chilian and Bolivian) in first and second hands) likely to be available, are—

	Ores.	Regulus.	Bars.	Ingots.	Barilla.
Liverpool	798	1515	8,380	1475	84
Swansea	3219	3168	2,203	164	257
Total	4017	4683	10,583	1639	341

Representing about 15,400 tons fine copper, against 22,100 tons fine copper, Nov. 15, 1870; 17,400 tons Nov. 15, 1869; 11,800 tons Nov. 15, 1868.

CHEMICALS AND MINERALS.—Messrs. J. Berger Spence and Co. (Manchester, Nov. 15.)—There has been an exceedingly brisk enquiry for chemicals, and a further advance has taken place in some descriptions. For home consumption the demand has been above the average. There is an evident anxiety amongst consumers to secure their forward requirements, which bodes no immediate reduction of price. Bleaching powder has in some degree recovered from its recent relapse, and it has more enquiries both for present and for forward delivery. Contracts for next year vary from 11*l.* to 12*l.* Soda ash maintains a good consumptive business, and manufacturers stand out for full rates. Caustic soda holds its strong position. Nitrate of soda has fluctuated, but closed in favour of sellers. Crystals have been rising, and better rates now prevail. Iron and copper salts are brisk. Muriate of potash, advanced 10s. Acids of all kinds firm. Bichrome still at its nominal price, 10d., with stocks rather large in makers' hands; the high price of this article is already telling in sales of the dyed goods. Prussiate of potash is rather firmer; demand increases. The prosperity of the coal trade is almost stereotyped. The demand for household coal, in consequence of the change of temperature, is rapidly increasing. The price in South Yorkshire has risen 1s., and in London 3s. 3d. The requirements for coal and coke for ironworks is very great. Gas coal is in great request; manufacturers are also pressing their demands. The consumption of coke in the Cleveland and West Coast districts is enormous, and likely to continue. A new coal field has been discovered at Hales Owen, near Dudley. The demand for hematites is unabated. The rush to Spain for iron ores appears absurd when we have rich sources undeveloped at home. The demand for phosphates of high percentage is very great, and corresponding efforts are making to supply it. Agriculturists need phosphates, and they will have them in increasing quantities. Sulphides of iron, copper, lead, and zinc are always saleable in large or small quantities. Manganese trembles for its future. Chromates of iron will find an extended market shortly. Plumbago scarcely saleable

IMPROVED FURNACE BARS.—Mr. W. HEESOM, of Nile-street, Sunderland, proposes to form rocking fire-bars, which have arms standing out from each side of them, with the upper edge of each of such projecting arm sloping downwards, and with an air hole through each arm; the arms on the two sides of the bar are also placed alternately instead of opposite to one another, as heretofore.

AWARDED TWENTY GOLD AND SILVER FIRST-CLASS PRIZE MEDALS.

IMMENSE SAVING OF LABOUR.

TO MINERS, IRONMASTERS, MANUFACTURING CHEMISTS, RAILWAY COMPANIES, EMERY AND FLINT GRINDERS, McADAM ROAD MAKERS, &c., &c.

BLAKE'S PATENT STONE BREAKER,

OR ORE-CRUSHING MACHINE,

FOR REDUCING TO SMALL FRAGMENTS ROCKS, ORES, AND MINERALS OF EVERY KIND.

This is the only machine that has proved a success. This machine was shown in full operation at the Royal Agricultural Society's Show at Manchester, and at the Highland Agricultural Society's Show at Edinburgh, where it broke 1¼ ton of the hardest trap or winstone in eight minutes, and WAS AWARDED TWO FIRST-CLASS SILVER MEDALS.

It has also just received a SPECIAL GOLD MEDAL at Santiago, Chili.

It is rapidly making its way to all parts of the Globe, being now in profitable use in California, Washoe, Lake Superior, Australia, Cuba, Chili, Brazil, and throughout the United States, and England. Read extracts of testimonials:—

The Parys Mines Company, Parys Mines, near Bangor, June 6.—We have had one of your stone breakers in use during the last 12 months, and Capt. Morcom reports most favourably as to its capabilities of crushing the materials to the required size, and its great economy in doing away with manual labour.

For the Parys Mining Company.

E. R. Marsden, Esq. JAMES WILLIAMS.

Idon Emery Works, Manchester.—We have used Blake's patent stone breaker made by you for the last 12 months, crushing emery, &c., and it has given every satisfaction. Some time after starting the machine a piece of the moveable jaws about 20 lbs. weight, chilled cast-iron, broke off, and was crushed in the jaws of the machine to the size fixed for crushing the emery.

E. R. Marsden, Esq. THOS. GOLDSWORTHY & SONS.

Alkali Works, near Wednesbury.—I at first thought the outlay too much for so simple an article, but now think it money well spent. WILLIAM HUNT.

Welsh Gold Mining Company, Dolgelly.—The stone breaker does its work admirably, crushing the hardest stone and quartz. WM. DANIEL.

Our 15 by 7 in. machine has broken 4 tons of hard winstone in 20 minutes, for fine road metal, free from dust. Messrs. ORD and MADDISON, Stone and Lime Merchants, Darlington.

Kirkless Hall, near Wigan.—Each of my machines breaks from 100 to 120 tons of limestone or ore per day (10 hours), at a saving of 4d. per ton. JOHN LANCASTER.

Ovoca, Ireland.—My crusher does its work most satisfactorily. It will break 10 tons of the hardest copper ore stone per hour. WM. G. ROBERTS.

General Frémont's Mines, California.—The 15 by 7 in. machine effects a saving of the labour of about 30 men, or $75 per day. The high estimation in which we hold your invention is shown by the fact that Mr. Park has just ordered a third machine for this estate. SILAS WILLIAMS.

Your stone breaker gives us great satisfaction. We have broken 161 tons of Spanish pyrites with it in seven hours. EDWARD AARON, Weston, near Runcorn

H. R. Marsden, Esq.

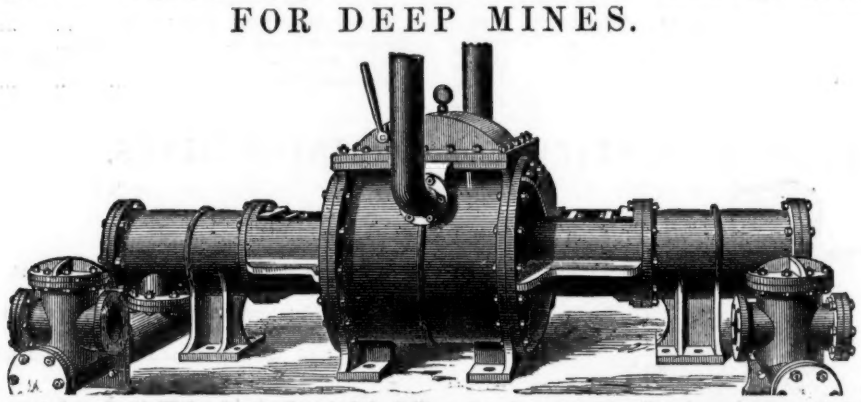
For illustrated catalogue, circulars, and testimonials, apply to—

H. R. MARSDEN, SOHO FOUNDRY,

MEADOW LANE, LEEDS,

ONLY MAKER IN THE UNITED KINGDOM.

HAYWARD TYLER AND CO.'S PATENT STEAM PUMPING MACHINERY FOR DEEP MINES.



The Machine erected in South Wales (at the Broad Oak Colliery, Loughor, near Llanelly), has a steam cylinder 40 inches diameter and two plungers of 8 inches diameter, and is raising 15,000 gallons of water per hour, the steam-boiler being on the surface. This it does with the greatest ease, the pump-valves working with scarcely any perceptible sound. The length of the incline besides the vertical lift is at present about 250 yards. The pump is constructed to be moved down the working as it advances, and is calculated to force the water to a height of 700 feet through a horizontal distance of 490 yards. For full description see *Mining Journal, Colliery Guardian, Engineering*, &c.

Sole Makers, HAYWARD TYLER & Co., Hydraulic Engineers,

84 and 85, UPPER WHITECROSS STREET, LONDON, E.C.

PATENT

"NE PLUS ULTRA" RESPIRATOR,

FOR

Coal Mines, Fire Brigades, Gas Companies, Breweries, Foul Wells, Chemical Works, Steam Ships, &c., &c.

This NEW RESPIRATOR is offered to the public as an INVALUABLE MEANS for SAVING LIFE and PROPERTY.

CERTIFICATE.

"I have used it successfully at several fires, and can with confidence recommend it as one of the most useful inventions that has ever been discovered to assist firemen in the discharge of their duties.

(Signed) *ALFRED TOZER,*

Superintendent Fire Brigade, Manchester."

PRICES:—No. 1, £8 8s.; No. 2, £9 9s.; No. 3, £10 10s. Goggles for firemen 10s. each extra. Lamps for collieries extra.

For particulars, apply to—

JAMES SINCLAIR,

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WM. A. PAGE AND CO., MANUFACTURING PERFUMERS,

CRICKLEWOOD, MIDDLESEX.

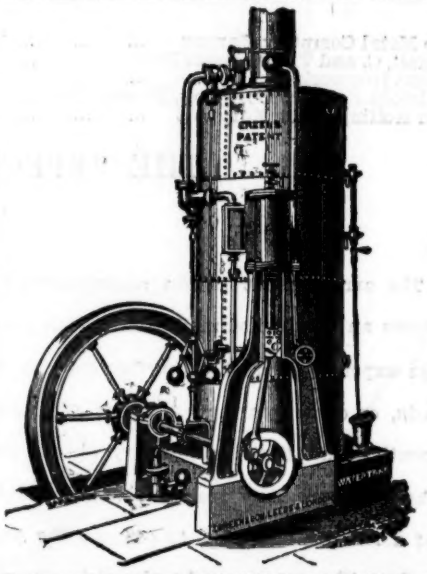
FAMILIES SUPPLIED with FANCY and other SOAPS cheaper than the Co-operative Stores. These Soaps are manufactured under a Patent, and are considered the best and cheapest in the world. Sample boxes, containing a dozen lb. bars, at 8s. per box; household, containing 28 lbs. in each box, at 8s. 6d., 9s. 6d., and 10s. 6d. per box. Orders punctually attended to.

A GOOD DISINFECTING SOAP, highly recommended by the Medical Profession, at 5s. the box, containing one dozen lbs.

GREEN'S PATENT BOILERS,

WITH INVERTED CYLINDER ENGINE COMBINED.

Specially adapted for Contractors, Joiners, and Builders, Cabinet-makers, Brick-makers, Farmers, Mills, Dye-houses, Workshops, Printing-offices, &c.



For Exportation they are invaluable, being sent out in complete working order, ready for immediate use.

The above Engines and Boilers are constructed in an exceedingly substantial and simple manner, every part being easy of access, consequently can be readily understood and managed; they are fitted with governors, equilibrium throttle valve, stop valve, safety valve, feed pump, water and steam gauges complete. The foundation plate answers the purpose of feed water tank, in which the water is heated before passing into the boiler, and also of an ash-pit, and no brickwork or foundation is required.

N.B.—Upwards of 600 of these Engines and Boilers are now at work, giving entire satisfaction.

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In this department we beg to call attention to our Specialities for Mines:—

BAILEY'S DUST AND DAMP-PROOF SIGNAL BELL..... £2 10 0

Bailey's Dust and Damp-proof Pushes, and other important Apparatus, as daily at work in the chief collieries in this kingdom and abroad.

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CORNWALL WORKS (TANGYE BROTHERS), BIRMINGHAM,

SOLE MAKERS OF

THE "SPECIAL" STEAM PUMPS.

Over 1000 in Use.

IN USE AT THE FOLLOWING QUARRIES:—

Carnarvon and Bangor Slate Co. ...	5	Pumps.
Kellow, J. E., North Wales Slate Co...	1	„
New Zealand Quartz Crushing and Gold Mining Company...	1	„
Scott, R. W., Dungannon, Ireland ...	1	„
Foster, J. S., Hebburn Quarries ...	1	„

IN USE AT THE FOLLOWING CHEMICAL WORKS:—

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Barnes, W. C., Hackney Wick... ...	2	„
Burt, Boulton, and Hayward, Tar Works, Millwall	1	„
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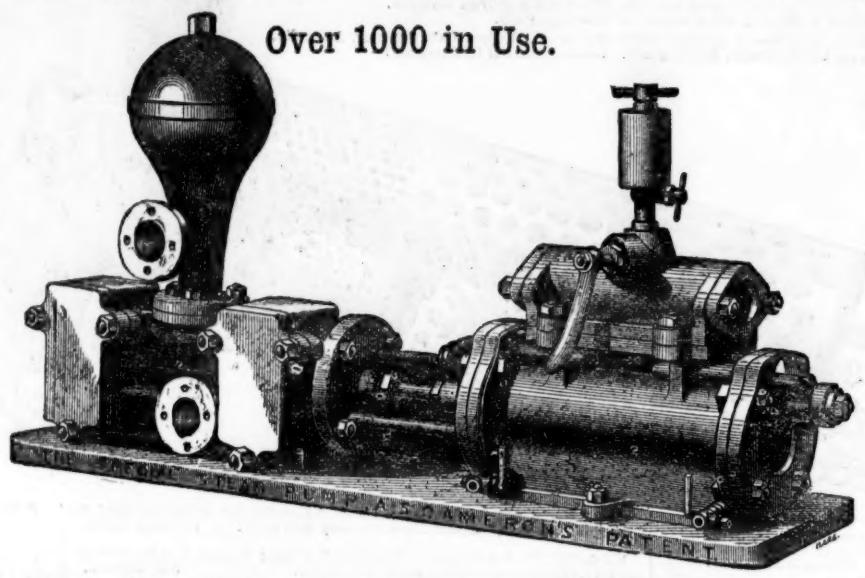
Whiffen, Thomas, Battersea	1	„
Jones, W., and Co., Middlesborough...	4	„
Jarrow Chemical Co., South Shields..	1	„
Richardson, J. G. and N. H., Jarrow-on-Tyne	1	„
Read, Holliday, & Sons, Huddersfield	1	„
Sheldon, Nixon, and Co., West Jarrow	2	„
Tennant, C., and Co., near Newcastle.	7	„
Webb, H., & Co. (Manure), Worcester	1	„
Union Chemical Company, Stratford..	1	„



NOTE.

Requires NO Shafting, Gearing, Riggers, or Belts.

All Double-Acting.

Works at any Speed, and any Pressure of Steam.

Will Force to any Height.

Delivers a constant stream.

Can be placed any distance away from a Boiler.

Occupies little space.

Simple, Durable, Economical.

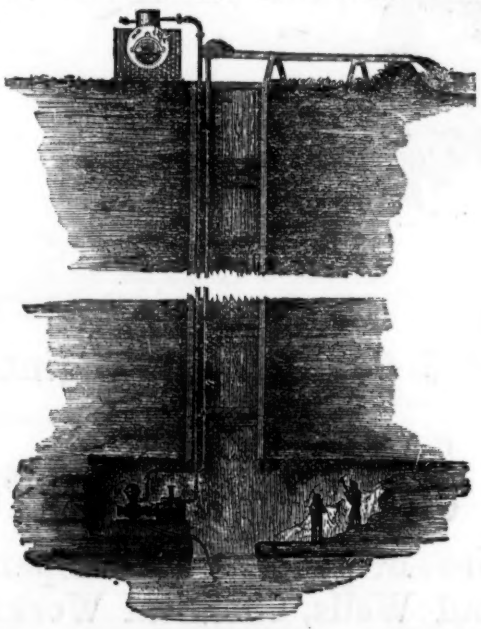
IN USE AT THE FOLLOWING COLLIERIES:—

Adelaide Colliery, Bishop Auckland	3	Pumps.	North Bitchburn Colliery, Darlington	2	Pumps.	Stott, James, and Co., Burslem	1	Pump
Acomb Colliery, Hexham	1	„	Newton Cap Colliery, Darlington...	1	„	Seaton Delaval Coal Company, near Newcastle	1	„
Blackfell Colliery, Gateshead	1	„	Normanby Mines	1	„	Thornley Colliery, Ferryhill	1	„
Black Boy Colliery, Gateshead	1	„	Oakenshaw Colliery	1	„	Thompson, John, Gateshead	2	„
Castle Eden Colliery	2	„	Pease's West Colliery	2	„	Trimdon Grange Colliery	1	„
Crofton, J. Ct., near Ferryhill	1	„	Pease, J. and J. W., near Crook	5	„	Tudhoe Colliery	4	„
Carr, W. C., Newcastle	4	„	Pease, J. and J., Brandon Colliery	1	„	Vobster and Mells Colliery	2	„
Etherley Colliery	1	„	Pegswood Colliery, near Morpeth	2	„	Widdrington Colliery, Morpeth	2	„
Gidlow, T., Wigan	3	„	Pelton Fell Colliery	1	„	Whitworth and Spennymoor Colliery	3	„
Haswell, Shotton, and Easington Coal Co.	2	„	Railey Fell Colliery, Darlington	1	„	Westerton Colliery, Bishop Auckland	1	„
Lochgelly Iron and Coal Company	1	„	Right Hon. Earl Durham, Fence Houses ...	1	„	Wardley Colliery, Gateshead	1	„
Leather, J. T., near Leeds	2	„	Skelton Mines	1	„	Westminster Brymbo Coal Company	2	„
Lumley Colliery, Fence Houses	1	„	South Benwell Colliery	4	„	Weardale Coal and Iron Company	5	„
Monkwearmouth Colliery, Sunderland... ...	1	„	St. Helens (Tindale) Colliery	1	„			

IRONWORKS AND ROLLING MILLS:—

Bede Metal Company, Jarrow	11	Pumps.	Gilkes, Wilson, Pease, and Co, Middlesboro'..	2	Pumps.	Whitwell and Co., Stockton	3	Pumps
Bagnall, C. and T., Grosmont Ironworks ...	2	„	Lloyd and Co., Middlesborough	1	„	Whessoe Ironworks, Darlington	1	„
Consett Ironworks	2	„	Solway Hematite Iron Company, Maryport ...	1	„	West Cumberland Hematite Iron Company ...	1	„
Castleford Foundry Company, Normanton ...	1	„	Vaughan, Thomas, Middlesborough	2	„	Westbury Iron Company	1	„
Ellen Rolling Mills, Maryport	1	„	The Shotts Iron Company, Edinburgh	1	„			

THE "SPECIAL" STEAM PUMP AS APPLIED FOR DRAINING MINES.



The arrangement in the accompanying illustration shows an economical method of draining mines without the expense of erecting surface-engines, fixing pump-rods, or other gearing. A boiler adjacent to the pit's mouth is all that is necessary on the surface; from thence steam may readily be taken down, by means of a felted steam-pipe, to connect the pump with the boiler. The pump may be placed in any situation that may be convenient for working it, and connecting the steam, suction, and delivery pipes.

These engines can be fixed and set to work in a comparatively short time, and also at a very small outlay. They are used in large mines as auxiliary engines, and will be found invaluable adjuncts in all mining operations.

To estimate the quantity of water to be raised by any given size of pump refer to the tabulated list below. It is recommended to use long-stroke pumps where the height exceeds 100 ft., so that the largest result may be obtained with a minimum wear and tear of the pump pistons and valves. The pumps are provided with doors for ready access to all working parts.

PRICES OF THE "SPECIAL" STEAM PUMPS.

Diameter of Steam Cylinder .....inches	2½	3	4	4	6	6	6	7	7	7	8	8	8	8	10	10	12	12	14	16	26
Diameter of Water Cylinder ....inches	1½	1½	2	4	3	4	6	5	6	7	4	6	7	8	6	7	8	10	8	7	6½
Length of Stroke ....inches	6	9	9	12	12	12	12	12	12	12	12	12	12	18	12	12	18	24	48	24	72
Strokes per minute	100	100	70	50	50	50	50	50	50	50	50	50	50	35	50	50	35	—	—	—	—
Gallons per hour	310	680	815	3250	1830	3250	7330	5070	7330	9750	3250	7330	9750	13,000	7330	9750	13,000	—	—	—	—
PRICE.....	£10	£15	£20	£35	£30	£40	£47 10	£50	£52 10	£57 10	£50	£55	£65	£85	£70	£80	£100	—	—	—	—

IF BRASS LINED, OR SOLID BRASS OR GUN-METAL WATER CYLINDERS, WITH COPPER AIR VESSELS, EXTRA, ACCORDING TO SIZE.

Any Combination can be made between the Steam and Water Cylinders, provided the Lengths of Stroke are the same, thus—8 in. Steam and 3 in. Water, or 10 in. Steam and 3 in. Water, adapted to height of lift and pressure of steam, and so on.

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London: Printed by RICHARD MIDDLETON, and published by HENRY ENGLISH (the proprietors), at their office, 26, FLEET STREET, E.C., where all communications are requested to be addressed.—Nov. 18, 1871.